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II

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Thiem (H.). **Erfolgreiche Bekämpfung der Pflaumensägewespen mit Quassia.** [The Successful Control of Plum Sawflies with Quassia.] —*Kranke Pflanze* **14** no. 4 pp. 59–65. Dresden, April 1937.

An account is given of the bionomics of *Hoplocampa minuta*, Christ, and *H. flava*, L., which have similar habits and cause similar injury to plums in Germany [*R.A.E.*, A **24** 799]. Both occur in almost equal abundance in western and south-western Germany, *H. flava* predominates on the North Sea coast, and *H. minuta* in central and eastern Germany.

Tests in various parts of the country have proved the efficiency of sprays of quassia extract with or without soap [**25** 210] against these sawflies. To prepare the spray with soap, 3 lb. quassia chips are soaked for several hours in 3 gals. water and then boiled for an hour. The liquid is strained off, and a solution of ¼ lb. soft soap in 1 gal. water is added to it. The mixture is then diluted to make 10 gals. The extract retains its active properties for several weeks, but is best used as fresh as possible, because it is known that the quassia in commercial preparations gradually loses its effectiveness. So far as possible, the spray jet should be directed upwards and from the interior of the tree crown outwards. To ascertain the best time for spraying, applications were made in a nursery at intervals from 6th to 18th May 1935 and from 9th to 16th May 1936. In each year, the first application was made when the larvae began to hatch, which they usually do when the petals are falling. Most of the withered calyces had fallen or the fruitlets had developed at the time of the last application. It was found that the spray was still active after the larvae had left the eggs, so that treatment can be effected during a fairly long period, though this would be shorter in fine, warm weather than in the cool weather of 1935 and 1936. The best time with early or medium blossoming plums is when most of the petals have fallen. Very early varieties, if attacked, require to be treated separately. Quassia acts on the eggs and also on the young larvae that come in contact with a sprayed surface or feed on sprayed fruitlets. The larvicidal action did not occur with Lepidoptera (*Cydia pomonella*, L., *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.). The quassia spray destroyed leaf Aphids, but was quite harmless to bees and to plants beneath the plum trees.

Stearns (L. A.). **Important Insects of the Year.**—*Bull. Del. agric. Exp. Sta.* no. 205 (Rep. 1935–36) pp. 27–29. Newark, Del., December 1936.

An account is given of the insect pests that occurred in Delaware during the year ended 30th June 1936. In a light-trap operated from April to August 1935, 904 adults of 10 species of *Lachnosterna* (*Phyllophaga*) were taken, including *L.* (*P.*) *ephilidia*, Say, from June to August (701 adults), *L.* (*P.*) *inversa*, Horn, in the last half of May (75) and *L.* (*P.*) *futilis*, Lec., from May to early July (64). Damage to older peach trees by *Aegeria pictipes*, G. & R. [*cf. R.A.E.*, A **24** 474] appeared to be increasing. Oak flooring made of wood imported from South Carolina in 1932 was so heavily infested by *Lyctus planicollis*, Lec., that it had to be removed. The beetles started to emerge in the autumn of 1935. Some of the same consignment of oak that had been stored in partly open sheds still appeared to be in good condition. The

Lyctid was heavily parasitised by *Monolexis lycti*, Cress. The periodical cicada [*Magicicada septendecim*, L.] emerged in late May and early June in the north of the State, but was not abundant. Some reduction in set of strawberries was caused by *Anthonomus signatus*, Say, which was unusually numerous in one locality, particularly during the blossoming of the plants. Infestation was especially severe on the edges of plantations adjoining woodlands. In June 1936, *Ligyrus gibbosus*, DeG. (carrot beetle) damaged sunflowers and canteloupes, but the infestation in one locality was checked by the parasite, *Sarcophaga rudis*, Aldr. *Scolytus multistriatus*, Marsh., the vector of the fungus [*Ceratostomella ulmi*] causing Dutch elm disease, has been taken in the extreme north of Delaware, and *Popillia japonica*, Newm., continues to spread southwards.

JONES (E. W.). **Practical Field Methods of sampling Soil for Wireworms.**—*J. agric. Res.* **54** no. 2 pp. 123–134, 7 figs., 12 refs. Washington, D.C., 1937.

The following is substantially the author's summary : An account is given of a method of sampling soil, designed to save time and labour in estimating wireworm populations and yet give fairly accurate results. The field equipment is described. Data were obtained with sampling units of three areas (1, $\frac{1}{4}$, and $\frac{1}{16}$ sq. ft.), 1–2 ft. deep according to season, taken at random over the field and subjected to a statistical analysis. The wireworm distribution is moderately asymmetrical for the 1-square-foot unit, the class-frequency decreasing with markedly greater rapidity on one side of the maximum than on the other. The distributions show close agreement with the Poisson series. It is shown that the largest units give most precision in estimating the mean. In determining the smallest number of sampling units that may be taken, comparisons were made on the basis of four different population densities for each of the three units. Little practical reduction of the sampling error is obtained at any population by using more than 50 samples to determine the average number of wireworms per sq. ft. of soil. At low population levels, it is necessary to take at least 50 samples. At the intermediate and high levels of population, a smaller number of samples is sufficient.

RICHARDSON (C. H.), DEONIER (C. C.) & SIMANTON (W. A.). **The Toxicity of certain Insecticides to the Chinch Bug.**—*J. agric. Res.* **54** no. 1 pp. 59–78, 6 figs., 45 refs. Washington, D.C., 1937.

The following is taken from the authors' summary of work in Iowa on the toxicity of certain contact insecticides to *Blissus leucopterus*, Say : Laboratory experiments showed that laundry soap was more toxic than sodium oleate, pure and commercial potassium oleate, and commercial potassium fish-oil soap, among which no significant differences were found. The adult bugs are generally more resistant than the nymphs. Kerosene emulsion at high oil concentrations was only mildly toxic ; emulsions that contained naphthalene dissolved in the oil were more toxic. Nicotine was more toxic to the adults than to the nymphs. Piperidine was relatively non-toxic. Pyrethrum extract in dilute acetone solution was highly toxic on the basis of total pyrethrin content and about equal to derris extract when the concentration of the latter was expressed as rotenone. On these bases, both pyrethrum extract and derris extract were much more toxic than rotenone. The latter was almost non-toxic to adults and fifth-instar nymphs. There was no difference in toxicity between acetone and carbon tetrachloride extracts of derris.

In field tests on maize, laundry soap was no more effective than commercial potassium oleate or potassium fish-oil soap. The laundry soap was less injurious to the plant, which suggests that soaps of the higher saturated fatty acids (palmitic and stearic) may be less toxic to maize. The alkalinity of the soaps may also be a factor. Nicotine and pyrethrum extracts gave results in substantial accord with those of the laboratory. Rotenone was less effective in the field than in the laboratory, as were also the derris extracts. Dipyridyl oil was non-injurious to the plant at effective concentrations.

When applied as dusts in the field, calcium cyanide was efficient only when the amounts applied were large enough to cause severe plant injury, and sodium fluoride, powdered derris, anabasine sulphate with bentonite and nicotine sulphate with bentonite were all relatively valueless.

The approximate descending order of toxicity in the laboratory of the various materials based upon the median lethal concentrations for the adults was: Pyrethrins and derris extract (based on rotenone content), nicotine, laundry soap, other potassium and sodium soaps, piperidine, kerosene-naphthalene emulsion, kerosene emulsion.

Smith (C. E.), Reid, jr. (W. J.), Harrison (P. K.) & Bare (C. O.). **A Study of arsenical Dusting of Cabbage in Relation to Poison Residues.**—*Circ. U.S. Dep. Agric.* no. 411, 8 pp., 1 fig. Washington, D.C., February 1937.

The following is taken from the authors' summary: In 12 experiments in South Carolina and Louisiana during two seasons to determine the limitations imposed by residue on treatments with arsenicals in controlling Lepidopterous larvae on cabbage, four dilutions (using lime as a diluent) of Paris green and calcium arsenate, and one dilution of lead arsenate were employed. The rates of application per acre ranged from 10 to 24 lb., the number of applications from 1 to 10, and the periods from last dusting to sampling from 8 to 100 days. The samples for determination of residue consisted of 10–20 plants trimmed to allow 4 loose wrapper leaves, except in one experiment in which the entire leaf growth was included. The studies were conducted under various conditions of rainfall, temperature and soil, and with three plant varieties. It was shown that, with intervals up to 30 days from the last application to marketing, cabbages may retain arsenical residues exceeding the legal tolerance of 0·01 grain arsenic trioxide per lb. The loose leaves surrounding the compact head carry most of the residues, which are also affected by rainfall and the variety of cabbage. Excessive residues were found in nearly all samples taken within 10 days after the last application of the arsenicals, in about 30 per cent. of those taken after about 20 days, and in less than 10 per cent. of those taken after 24–30 days. For periods exceeding 30 days no excessive residues were found. According to the data obtained, it appears unsafe to apply arsenicals on cabbage after foliage becomes exposed that will be a part of the marketed product.

Entomology.—*Bull. Ohio agric. Exp. Sta.* no. 561 (Rep. 1934–35) pp. 43–51, 1 fig. Wooster, Ohio, January 1936. [Recd. 1937.]

In studies conducted in Ohio by [J. P.] Sleesman, there was a significant difference between the numbers of nymphs of *Empoasca fabae,* Harr., on 2 out of 12 varieties of potato under observation. According to [L. L.] Huber, about 78 per cent. of the larvae from eggs of *Pyrausta nubilalis,* Hb., placed, when ready to hatch, on maize 2½ ft. high, perished within 48 hours under normal conditions. Whatever influence the tassel may have on the resistance of a variety, its influence on the first-instar larvae, which seldom have the opportunity to feed on the tassel buds, is negligible. In the northern part of the State, there was found to be a correlation of –0·65 between the yield of wheat per acre and the population of the chinch bug, *Blissus leucopterus,* Say, in the following spring.

R. B. Neiswander reports that 2,238 examples of *Macrocentrus ancylivorus,* Rohw., were reared in 1935 from larvae of *Cydia* (*Grapholitha*) *molesta,* Busck, collected chiefly in Ottawa and Lake counties, and released in other areas of Ohio where this Braconid was not known to be present. In two orchards which, in 1934, had had large populations of *C. molesta* showing only very slight parasitism, none of which was due to *M. ancylivorus,* 63 per cent. parasitism, of which 68 per cent. was due to the introduced species, was found in the generation following the release. In Ottawa county, the infested peach twigs collected yielded 267 *C. molesta* and 2,143 parasites, of which 92 per cent. were *M. ancylivorus* ; the parasites were so effective that few larvae damaged the fruit, despite a high adult population in July. Parasitism continued to be high in most of the northern part of the State, and injury by *C. molesta* was less severe than for many years past. In spraying experiments against *C. molesta* on quince, a spray of summer oil (1½ per cent.) with nicotine sulphate (1 : 1,200), applied five times at intervals of 10 days beginning on 3rd August, produced fruit 72 per cent. of which was free from visible injury by the larvae.

In an experiment by C. R. Neiswander, lead arsenate gave about 77 per cent. mortality of newly hatched larvae of *Lachnosterna* (*Phyllophaga*) *hirticula,* Knoch, in 5 weeks when applied to the surface of the soil at the rate of 5 lb. per 1,000 sq. ft. and watered in, whereas Dutox [80 per cent. barium fluosilicate] at the same rate gave only 32 per cent. mortality. A new sulphated alcohol spreader and adhesive at 1 : 500 with various commercial rotenone sprays increased the kill of *Tetranychus telarius,* L., by approximately 11 per cent. over that produced by the same rotenones with various soap spreaders at 1 : 250. An aliphatic thiocyanate (Loro) in water (1 : 600) with various spreaders gave 90–100 per cent. kill of *Thrips tabaci,* Lind., in the greenhouse. Some plants were slightly injured. Paris green (8 oz.), brown sugar (30 lb.) and water (50 U.S. gals.) [*cf.* **22** 536] continued to give the best control of *Taeniothrips simplex,* Morison (*gladioli,* Mlt. & Stnw.) on gladiolus, but caused foliage injury that reduced the yield of corms by 15–20 per cent.

In tests by [H. L.] Gui of insecticides against *Pieris* (*Ascia*) *rapae,* L., *Plusia* (*Autographa*) *brassicae,* Riley, and *Plutella maculipennis,* Curt., on cabbage, weekly applications of a spray of 2 lb. Paris green in 50 U.S. gals. water with a sulphated alcohol as a wetting agent produced the greatest percentage (97) of marketable heads. Averages of 90–93 per cent. marketable heads were produced on plots dusted weekly with Paris green, lime and diatomaceous clay (2 : 2 : 13 and 2 : 2 : 23), lead arsenate and diatomaceous clay (2 : 13) and derris powder and flour (0·5 per cent. rotenone) and on plots sprayed at intervals of one and two weeks with lead arsenate (2 lb. to 50 U.S. gals. water) with sulphated alcohol as a wetting agent. Untreated plots produced 36 per cent. marketable heads. Onions infested with *Euxoa messoria*, Harr. (dark-sided cutworm) were treated experimentally with insecticides prepared according to 9 formulae. A table shows the average number of larvae per 150 sq. ft. remaining 30 hrs. after treatment. The fewest (1·2) were found on plots dusted with lead arsenate, lime and flour (1 : 1 : 2), the untreated plots having 15·8 and dusts in all tests being more effective than sprays.

[C. R.] Cutright found tar distillates superior to mineral oil emulsions or lime-sulphur and nicotine for the control of Aphids on apple. They did not control Coccids or European red mite [*Paratetranychus pilosus*, C. & F.].

BALLOU (F. H.). **Stationary Equipment for Orchard Spraying and the Manufacture of home-made liquid Lime-sulfur.**—*Bull. Ohio agric. Exp. Sta.* no. 572, 26 pp., 7 figs. Wooster, Ohio, July 1936. [Recd. 1937.]

Experiments have been carried out in Ohio since 1929 on the practicability of using stationary spraying equipment [*cf. R.A.E.* A **15** 182; **19** 89; **24** 439] in orchards in which the hilly nature of the country makes it almost impossible to use movable sprayers or dusting machines. A detailed description is given of a stationary plant that has been in successful use for 7 years, with notes on its operation. The advantages and disadvantages of the system, possible modifications of it, the choice of a suitable situation and relative initial cost and running expenses are discussed.

The second part of the paper (pp. 19–26) comprises an account of the methods of making liquid lime-sulphur concentrate and the equipment required.

HUTSON (R.). **Leafhopper Control on Grapes.**—*Quart. Bull. Mich. agric. Exp. Sta.* **19** no. 3 pp. 142–144. East Lansing, Mich., February 1937.

Brief notes are given on the bionomics and control of the grape leafhopper [*Erythroneura comes*, Say] on vines [*cf. R.A.E.*, A **24** 772]; damage by it in Michigan is most serious in dry seasons [*cf.* **19** 554].

McDANIEL (E. I.). **Periodical Cicada Control in Michigan for 1936.**—*Quart. Bull. Mich. agric. Exp. Sta.* **19** no. 3 pp. 144–146, 2 figs. East Lansing, Mich., February 1937.

In 1936 the distribution of *Magicicada septendecim*, L., in Michigan was restricted, with few exceptions, to open stands of hickory and oak in the more southern counties. It was scarce or absent on previously infested land that had undergone intensive cultivation for several years before planting. The first adults appeared on 29th May, and by 20th June almost all had disappeared. The males emerged first and predominated for the first week. The eggs began to hatch in the first week of August. The punctures in which they are laid cause more serious damage to young trees than to those that are mature, and valuable nursery stock may be protected by loosely wrapping the young trees in cheap cloth.

In experiments on control, several hundred nymphs were sprayed with various contact insecticides, including oil emulsions and mixtures containing derris, nicotine sulphate, pyrethrum, and thiocyanates, but none of these was effective. The adults were killed by sprays containing thiocyanates at concentrations of not less than 1 per cent., but all these scorched the foliage. Lower concentrations, at which the foliage was unharmed, were not lethal. Nicotine sulphate (1 : 400) with soap gave a satisfactory commercial kill. It was found practicable to knock the adults from the trees with a pyrethrum or thiocyanate spray, both at 1 : 150, and to kill, with a blow torch, those surviving after 10–12 hours. Less than 5 per cent. of the eggs hatched on trees sprayed with ¾ pint nicotine sulphate in 100 gals. 1½ per cent. summer oil emulsion.

ALDEN (C. H.) & WEBB, jr. (J. E.). **Control of Injurious Insects by a Beneficial Parasite.**—*Bull. Dep. Ent. Georgia* no. 79, 23 pp., 10 figs. Atlanta, Ga, February 1937.

The following is largely taken from the authors' summary of the results of the rearing and liberating of *Trichogramma minutum*, Riley, against injurious Lepidoptera in Georgia : A laboratory was built in 1929 for the artificial rearing of *T. minutum* and *Sitotroga cerealella*, Ol., and it has been in operation [*cf. R.A.E.*, A **19** 490] since that time, except for the year 1934. Special equipment was developed during the period of the experiments. Millions of *T. minutum* and eggs of *S. cerealella* as hosts for them have been produced. The parasites have been of chief use as a supplement to measures for the control of *Cydia* (*Grapholitha*) *molesta*, Busck, and *Cydia* (*Carpocapsa*) *pomonella*, L. ; they have given poor results against *Acrobasis* spp. on pecan. During the period 1929–36, farmers were supplied with over 138 million parasites. Experiments to determine their effectiveness against *C. molesta* on peach showed that the percentages of fruits infested at harvest time in colonised and uncolonised areas were 16·3 and 31·5, respectively, in 1931, and 0·15 and 0·55 in 1936, when general infestation was extremely low. Collections of eggs of *C. molesta* showed an average parasitism in 1930, 1931 and 1932 of 46·0, 12·5 and 36·1 per cent., respectively. In experiments against *C. pomonella*, the percentages of apples infested at harvest time in colonised and uncolonised areas, respectively, were 32·4 and 60·6 in 1933, 64·9 and 59·7 in 1934 (when the supply of parasites was limited), and 16·2 and 24·3 in 1935. During the period of the tests, 31,632 codling moth eggs were collected in various apple orchards in which *Trichogramma* had been liberated. The highest percentage parasitised in any one collection was 97·6 in 1933, and the lowest 0 in 1933 and 1934 ; the highest yearly average for the period was 77·6 in 1932, and the lowest 26·2 in 1936.

PEPPER (B. B.). **The European Corn Borer in New Jersey.**—*Circ. N. J. agric. Exp. Sta.* no. 370, 15 pp. New Brunswick, N.J., September 1936. [Recd. 1937.]

A brief account is given of the bionomics of the European corn borer [*Pyrausta nubilalis*, Hb.] in New Jersey, where it has one generation in the north-west and two in the east. Methods of control are discussed with particular reference to cultural measures and the use of farm machinery [*cf. R.A.E.*, A **23** 198].

Pickett (A. D.). **Studies on the Genus** *Rhagoletis* (**Trypetidae**) **with special Reference to** *Rhagoletis pomonella* (**Walsh**).—*Canad. J. Res.* (D) **15** no. 3 pp. 53–75, 25 figs., 35 refs. Ottawa, March 1937.

This is a report on an investigation of the biological and morphological relations of certain North American Trypetids of the genus *Rhagoletis*, particularly those that develop on apple, hawthorn [*Crataegus*] and blueberry [*Vaccinium*] in Nova Scotia, as the presence of these bushes near one another gives considerable economic importance to the possibility of free movement of the flies from one to another. Studies extending over 4 years failed to show any significant difference in the characters of the male genitalia of the forms of *R. pomonella*, Walsh, occurring on apple and hawthorn and the forms from blueberry and snowberry (*Symphoricarpus*), which were described by Curran, on the basis of these characters, as *R. mendax* and *R. symphoricarpi*, respectively [*R.A.E.*, A **20** 464; **12** 531]. The ejaculatory apodeme, which varies greatly in the individuals of each group, appears useless for purposes of identification. The most constant feature was the tip of the penis, in which there was no variation in the four forms, whereas in all the well-defined species studied, there were distinct differences. A study of the larvae failed to indicate any significant differences between maggots from hawthorn, apple, blueberry and snowberry. Examination also showed the male genitalia of *R. cingulata*, Lw., and *R. indifferens*, Curran [**20** 464], to be identical, but in *R. berberis*, Curran, *R. fausta*, O.-S., *R. tabellaria*, Fitch, and *R. ribicola*, Doane, they appeared distinct; there were only slight differences between those of *R. completa*, Cresson, and *R. suavis*, Lw. The author considers *indifferens* a synonym of *cingulata* and *completa* at most a subspecies of *suavis* [*cf.* **23** 413].

In the case of the forms from apple, hawthorn and blueberry in Nova Scotia, morphological investigations were supplemented by breeding, by methods that are described in detail. The flies were fed on a diet already noticed [**19** 342], but were induced to breed on food-plants other than those on which they had developed only when milk (5 per cent.) was added to it. In 1934, 12 cages were used for breeding experiments. Of these, 8 gave negative results, which were not significant, as some adults failed to give rise to offspring on the food-plant from which they had been collected. Females reared from apples paired with males collected on blueberry and oviposited in apples, and 27 pupae were produced [*cf.* **23** 645]. Adults collected on apple trees oviposited in blueberries and 6 pupae were obtained; moreover, it is thought that several larvae escaped. These results were confirmed in 1935, but all crosses and also flies reared from hawthorn failed to produce offspring on blueberry. Adults collected from blueberry bushes gave rise to 14 pupae on apple. This is thought to be the first record of the blueberry form breeding on apple. Females reared from apple and males from hawthorn gave only one larva on apple; 17 larvae developed from eggs deposited in apple by adults reared from hawthorn. Males and females from apple behaved normally on hawthorn whether they had been collected from the trees or reared in the insectary, and pupae were obtained in both cases. Females from hawthorn paired with males from apple and gave rise to 36 pupae on hawthorn. Adults from blueberry failed to produce pupae on hawthorn, though there was evidence of attempted oviposition. The females appeared to experience difficulty in piercing the haws to deposit eggs. Males and females of the apple form failed to give rise to larvae when put in cages with plum and chokecherry (*Prunus virginiana*), although the author had taken larvae on plum in Nova Scotia. On pear, three pupae were obtained in one experiment [*cf.* **16** 568], but none in two others. Hawthorns growing within a few feet of heavily infested blueberries or apples were absolutely free from maggots for several years in succession and *vice versa.*

It is suggested that only one species (*R. pomonella*) is involved, in which the host-selection principle enunciated by A. D. Hopkins [**10** 83] has become highly developed.

ANDISON (H.). **The Juniper Webworm** (*Dichomeris marginella* **Fabr.**).—*Proc. ent. Soc. B. C.* no. 33 pp. 3–5, 1 ref. Victoria, B.C., January 1937.

Dichomeris marginella, F., was first reported from Vancouver Island on two varieties of *Juniperus communis* in 1934 and 1935, respectively. As many varieties of juniper are used for ornamental purposes in British Columbia, an investigation was made in 1935–36 on the bionomics of this moth. The account given of them is almost identical with an earlier one from New Jersey [*R.A.E.*, A **10** 279]. The egg and pupal stages under laboratory conditions in British Columbia lasted about 20 and 20–35 days, respectively. McDaniel's recommendations for control [*cf.* **22** 530] are quoted.

DENNYS (A. A.). **An Orthopterous Pest of Apple Trees in the Interior of B.C.**—*Proc. ent. Soc. B. C.* no. 33 pp. 6–7, 1 fig. Victoria, B. C., January 1937.

In the south of British Colombia, small apples, and, to a less extent, young peaches about an inch in diameter and small prunes, have been damaged by the cricket, *Cyphoderris monstrosus*, Uhler, which feeds on them at night. During the day, it hides in rubbish under boards and logs, or in cracks in the ground, and damage is usually confined to orchards where such shelter is available. It is thought that the degree of injury seldom justifies the heavy application of arsenical sprays that would be necessary to effect control.

GLENDINNING (R.). **The Status of the Gladiolus Thrips in British Columbia.**—*Proc. ent. Soc. B. C.* no. 33 pp. 13–14. Victoria, B.C., January 1937.

Taeniothrips simplex, Morison, was first recorded on gladiolus in British Columbia in 1933 [*cf. R.A.E.*, A **23** 731 ; **21** 479], and a few outbreaks occurred in 1934. The winter of 1933–34 was unusually mild, but observations in infested fields showed that the thrips did not survive in the open even where infested corms had been left in the soil and where the ground was not frozen at any time, being under snow during the only cold spell. Other Thysanoptera found on gladiolus during inspection work were *Aeolothrips fasciatus*, L., *Thrips madroni*, Moult., *Frankiniella moultoni*, Hood (*californica*, Moult.), *Taeniothrips vulgatissimus*, Hal., and *T. atratus*, Hal. This last species was found on several occasions abrading the epidermis of the petals of the lilac-coloured varieties, but the others appeared to feed on pollen and to be harmless.

OLDS (H. F.). **The Life History and Habits of the Red-legged Ham Beetle** *Necrobia rufipes* **(De Geer)**.—*Proc. ent. Soc. B. C.* no. 33 pp. 40–41, refs. Victoria, B. C., January 1937.

Brief notes, based mainly on abstracts in this *Review*, are given on the various types of stored products infested by *Necrobia rufipes*, DeG. It has been frequently intercepted in imported products in Canada, and was recently found in numbers in three cargoes of copra docked in Vancouver for transhipment. In warm weather, the beetles crawl for considerable distances, but the weather was cold when these consignments were received, and this drove most of them into the sacks of copra. The danger of their spread was eliminated by removing other products to a distance and carefully sweeping and spraying the storage space after the copra had been reshipped.

SPENCER (G. J.). **The Termite Situation in British Columbia in 1936.**—*Proc. ent. Soc. B. C.* no. 33 pp 42–43. Victoria, B. C., January 1937.

In British Columbia, the three termites, *Reticulitermes hesperus*, Banks, *Zootermopsis nevadensis*, Hag., and *Z. angusticollis*, Hag., were formerly confined to old stumps and logs [*cf. R.A.E.*, A **20** 68], but *Z. angusticollis* has recently caused severe damage in the Vancouver district to structural timbers in or near the ground in buildings, etc. This species was observed to have established itself by flight in parts of a pole 4–5 ft. above the ground and to have excavated dry timber resting against cement.

BLANCHARD (E. E.). **Apuntes sobre Himenópteros útiles argentinos (Ichneumonoidea).** [Notes on beneficial Hymenoptera from Argentina.]—*Rev. argent. Ent.* **1** no. 2 pp. 37–50, 5 figs. Buenos Aires, 31st March 1936. [Recd. May 1937.]

The following new parasites are described: the Ichneumonids, *Eudeleboea* (gen. n.) *lopezi* and *Pimpla behrensiella*, both reared from *Cydia* (*Laspeyresia*) *molesta*, Busck [*cf. R.A.E.*, A **24** 638, 639], and *Neochristolia* (gen. n.) *eucleidis*, from *Phobetron hipparchia*, Cram., and *Sibine nesea*, Stoll; and the Braconids, *Ipobracon mundelli*, from *Tucumania tapiacola*, Dyar, and *Meteorus deltae*, from *Hypocrisias* (*Halisidota*) *fuscipennis*, Burm.

The other parasites recorded are: *Pimpla tomyris*, Schrottky, from *Oeceticus kirbyi*, Guild., *Eudyaria* (*Coloradia*) *venata*, Btlr., and *Phobetron hipparchia*; *Hemiteles venturi*, Schrottky, from *Cydia molesta*; *Agathis versicolor*, Brèthes, from a caterpillar on the leaves of cotton; and *Meteorus chilensis*, Porter, from *Feltia malefida*, Gn.

MILLER (D.), CLARK (A. F.) & DUMBLETON (L. J.). **Biological Control of noxious Insects and Weeds in New Zealand.**—*N.Z. J. Sci. Tech.* **18** no. 7 pp. 579–593. Wellington, N.Z., December 1936.

In three of the five sections of this paper, Miller briefly discusses a few of the more outstanding instances of successful biological control of insect pests in various parts of the world, and surveys work on the introduction into and establishment in New Zealand of insects that attack noxious weeds and of parasites of insect pests of field-crops and of a blowfly infesting sheep. In another section, Clark deals with the introduction of natural enemies of insect pests of forests. He points out that the peculiar conditions in New Zealand that have led to the establishment of very large pure stands of even-aged exotic trees are providing new and complex problems of forest management. Sylvicultural methods that are adequate for the control of pests elsewhere are often impracticable there for economic reasons, and should be supplemented by the establishment of parasites wherever possible. The remaining section is by Dumbleton, who gives short notes on the attempted introduction into New Zealand of 37 insect parasites or predators to control about 12 orchard pests. Of 24 that were liberated, 5 parasites and 6 predators have become established.

TAKAHASHI (R.). **Biology and Control of the Ant,** *Polyrhachis dives* **Smith.** [*In Japanese.*]—*Bull. Govt Res. Inst. Formosa* no. 129, 12 pp., 6 figs. Taihoku, Formosa, March 1937.

Polyrhachis dives, F. Smith, which is common in Formosa, constructs its nests on *Citrus* and a variety of other plants by binding the leaves and twigs together with silk obtained from the larvae, so as to form a shelter ; the process is described in detail. The ants attack man viciously and render it almost impossible to work on *Citrus* infested by them. They also foster various Aphids and Coccids, and may be directly injurious to plants, as they sometimes feed on the young leaves of *Crotalaria* and *Tephrosia* and the unripe seeds of wheat. Near Taihoku, the winged sexual forms appear from late October to early May, and all stages are found throughout the year, though the ants are very inactive on cold days in winter. The larvae of a species of *Batrachedra* are often found in the nests of this ant and attack its larvae. One of the best methods of control is to attach pieces of bamboo stem to *Citrus* trees, as the ants then nest in them, instead of among the leaves.

FUKUDA (K.). **Researches concerning** *Hispa similis* **Uhmann.** [*In Japanese.*]—*Bull. Govt Res. Inst. Formosa* no. 130, 24 pp., 1 pl. Taihoku, Formosa, March 1937.

Hispa similis, Uhmann, all stages of which are described and which was formerly recorded as *Hispa armigera*, Ol. [*cf. R.A.E.*, **16** 418], is very injurious to rice in Formosa and also feeds on grasses, including *Zizania latifolia*, and occasionally on sugar-cane. It has 3–5 generations a year, usually 3, and overwinters in the adult stage. The adults begin to attack rice early in March, but become more abundant later in the season and cause greater damage to the second crop than to the first. The female gnaws a slit in the lower surface of a leaf and lays an egg in it, usually covering it with excreta. Young leaves are preferred for oviposition, and a female lays 3–173 eggs in 7–48 days. The duration of the egg stage varies from 15 days in spring to 4 in summer, and the larval and pupal stages last 13–22 and 5–8 days, respectively. The larvae mine in the leaves and pupate in their mines, but they migrate from an older leaf to a younger one

1–4 times. Pairing and oviposition take place about 5 and 9 days, respectively, after emergence, and adults can survive 2–38 days without food. Those that emerge before early September may live as long as 87 days but do not overwinter ; those that emerge after that time hibernate in the basal parts of grasses near rice-fields, and feed occasionally. Burning the grass in winter is thus an effective method of control. The adults can also be destroyed by hand collection, especially in the early spring, in early morning or on rainy days, when they are not active, or by contact sprays, such as nicotine sulphate or 5 lb. pyrethrum and 6 lb. soap in 120 gals. water.

A few of the larvae were found to be attacked by two unidentified parasites, and 8·6–15·5 per cent. by *Microbracon hispae*, Vier., which is briefly described and which has several generations a year, completing its life-cycle in 10–17 days in hot weather.

YANAGIHARA (M.). **Control Methods for** *Melanauster chinensis* **Forst., a Pest of** *Casuarina equisetifolia*. [*In Japanese.*]—*J. Formosan Sug. Plant. Ass.* **15** no. 2 pp. 23–26. Taichu, Formosa, February 1937.

The Lamiid, *Melanauster chinensis*, Forst., attacks and sometimes kills *Casuarina equisetifolia*, which is widely planted in Formosa as a windbreak and to prevent sand-drift. It is frequently found near villages and sand-hills where *Melia azedarach* and *Broussonetia papyrifera*, other favoured food-plants, are cultivated. The adults are most abundant from April to June, but can be found till October. Each female lays about 70–80 eggs singly in the basal parts of the stems. The larvae hatch in 7–10 days and require about a year for development ; the pupal stage lasts 10–15 days. Methods suggested for control include removal of alternative food-plants growing near *C. equisetifolia* and some of the measures employed against this Lamiid on *Citrus* [see next abstract].

TAKAGI (M.). **Upon the Extermination and Prevention of Citrus** *Melanauster*. **Preliminary Report.** [*In Japanese.*]—*Hort. Trop.* **7** no. 1 pp. 27–34. Taihoku, Formosa, March 1937.

Melanauster chinensis, Forst., causes serious injury to *Citrus* trees in Formosa. Oviposition occurs in the basal parts of the stems and may be prevented by brushing them with a wash consisting of 200 lb. lime, 30 lb. lard, 30 lb. salt and 3 lb. lead arsenate in 80 gals. water, or by covering them with newspaper, straw or palm leaves, though such covers afford shelter to Coccids and ants. Up to 90 per cent. mortality of the larvae may be obtained by injecting formalin or calcium cyanide into their burrows ; carbon bisulphide is less effective.

SHIBATA (K.). **Relation between Lemon-fruit and Damage by the Fruit-fly,** *Chaetodacus ferrugineus* **var.** *dorsalis* **Hendel.** [*In Japanese.*]—*J. Soc. trop. Agric.* **9** no. 1 pp. 60–68. Taihoku, Formosa, April 1937.

Dacus (*Chaetodacus*) *dorsalis*, Hend., is a serious pest of the fruits of *Citrus* in Formosa, but the larvae do not infest lemons, though the females oviposit in them. An account is given of experiments showing that the eggs hatch readily in the skin of the lemon and that the larvae mature when fed on the inner part of the fruit, but that lemons are immune from infestation because the inner skin is too hard to be penetrated by the ovipositor of the fly or by the newly hatched larvae (which cannot survive without feeding for more than 70 hours at 30°C. [86°F.]). Grapefruit is also immune for the same reason.

TAKAHASHI (R.). **Some Observations on the Insect Pests of agricultural Plants in the mountainous Regions in Formosa. 2.** [*In Japanese.*] —*J. Soc. trop. Agric.* **9** no. 1 pp. 69–78. Taihoku, Formosa, April 1937.

A list is given of 30 species of Coccids found on *Citrus* and other cultivated plants in the mountains of Formosa [*cf. R.A.E.*, A **25** 228]. All are common in the lowlands, and many are imported. *Icerya aegyptiaca*, Dougl., *Pseudococcus filamentosus*, Ckll., *Ferrisiana virgata*, Ckll., *Saissetia nigra*, Nietn., and *Ceroplastes* spp., were not found, though they are numerous in the lowlands. Most of the species occurring in the mountains are polyphagous, but not well adapted to the local wild plants. *Saissetia coffeae*, Wlk. (*hemisphaerica*, Targ.), *Aonidiella* (*Chrysomphalus*) *aurantii*, Mask., *Aulacaspis yabunikkei*, Kuw., and *Fiorinia theae*, Green, were very widely distributed. *A. aurantii* was found at over 6,600 ft. above sea level, but the other species seldom occurred above 5,000 ft. *C. ficus*, Ashm. (*aonidum*, auct.), *Lepidosaphes beckii*, Newm., and *Aulacaspis* (*Diaspis*) *pentagona*, Targ., were common below 3,800 ft. About 25 species of Aphids are also recorded from cultivated plants in the mountains. Of these, *Paratrichosiphum tattakanum*, Takah., *Brevicoryne brassicae*, L., *Myzus momonis*, Mats., and *M. mushaensis*, Takah., which were found on chestnut, cabbage, peach and cherry, respectively, have not been observed in the lowlands. *Macrosiphum gobonis*, Mats., on *Arctium lappa*, and *M. rosae ibarae*, Mats., on rose, were found at about 10,000 ft., and *Myzus varians*, Davids., on peach, and *Micromyzus formosanus*, Takah., on onion, at over 6,600 ft.

MAKINO (S.). **On some Animals newly introduced to Chichi-zima in the Bonin Islands.** [*In Japanese.*]—*Ecol. Rev.* **3** no. 1 pp. 61–63, 3 figs. Sendai, Japan, 1937.

Dacus (*Chaetodacus*) *ferrugineus*, F., which is apparently an introduced species in the Bonin Islands, has caused serious damage there during the last 2 or 3 years to banana, papaya and other fruits.

MONZEN (K.). **Host Selection and Immunity of Plants.** [*In Japanese.*] —*Sci. Bull. Alumni Soc. Morioka Coll. Agric.* **11** pp. 29–34, 8 figs. Morioka, Japan, 1936.

Byrsocrypta (*Tetraneura*) *gallarum yezoensis*, Mats., which is very common in northern Honshu, produces galls on *Ulmus japonica* and lives in summer on the roots of grasses. The sexuparae also migrate each year to *U. pumila* (which has been introduced from Manchuria) and both they and the sexuales reproduce. In the following spring, however, the larvae from the fundatrices die, since they are unable to produce galls on this species of elm. An allied Aphid, which is briefly described and believed to be *Byrsocrypta gallarum*, Gmel. (*T. ulmi*, DeG.) was observed on *U. pumila* in Manchuria. The leaves of this tree are smaller, thinner, harder and grow more slowly than those of *U. japonica*, but do not differ chemically.

MONZEN (K.). **On** *Contarinia soya* **sp. n.** [*In Japanese.*]—*Sci. Bull. Alumni Soc. Morioka Coll. Agric.* **12** pp. 45–58, 2 pls. Morioka, Japan, 1936.

The larvae of *Contarinia soya*, sp. n., the adult of which is described, attack the petioles of soy beans in Japan [*cf. R.A.E.*, A **24** 700; **25** 303]; 7–104 have been observed in a single petiole. There is one generation a year, the adults emerging in July and August. The larvae mature in about a month and hibernate in the soil.

HAMAI (Y.). **Practical Observations on the Injuries caused by Orthoptera to the Rice Plant.** [*In Japanese.*]—*J. Plant Prot.* **24** no. 4 pp. 264–271. Tokyo, April 1937.

Brief notes are given on the injuries caused to rice in Japan by some Orthoptera, including *Oxya* spp., *Atractomorpha bedeli*, Boliv., *Acrida lata*, Motsch., *Gryllulus* (*Gryllus*) *mitratus*, Hagen., and *Gryllotalpa africana*, P. de B.

HARUKAWA (C.) & KUMASHIRO (S.). **On** *Tipula aino*, **Alexander. II. Relation of its Development to environmental Factors.** [*In Japanese.*]—*Nogakukenkyu* **27** pp. 1–71, 11 figs. Kurashiki, Japan, March 1937.

Under natural conditions in Okayama Prefecture, where it is a serious pest of rice, the summer generation of *Tipulo aino*, Alexander [*cf. R.A.E.*, A **24** 697] is completed in about 20 weeks, and the winter one in 32. In experiments at constant temperatures, the life-cycle lasted 240 days at 10°C. [50°F.],132 at 20°C. [68°F.] and 129 at 25°C. [77°F.]. The optimum temperature for adult longevity was 5°C. [41°F.], but pairing and oviposition did not occur below 10°C. Atmospheric humidity, unless very low, had little effect on survival, but the flies lived much longer if given water. The average duration of the preoviposition period was 6–7 days in spring, 5 in autumn and 22 at 10°C. Females laid about 600 eggs each in spring and about 400 in autumn. At 25°C., 90 per cent. of the eggs in the ovaries were deposited, whereas only 20 per cent. were laid at 20°C., and normal oviposition did not occur at 35°C. [95°F.]. Almost all the eggs hatched if the soil contained 65 per cent. water, but none if it contained only 35 per cent. The optimum temperatures for eggs, larvae and pupae were 20, 25 and 20°C., respectively. The eggs hatched only within temperature limits of 5–33°C. [41–91·4°F.]; 40 per cent. were killed by exposure to 5°C. for 20 days. The egg stage averaged 4·7 days at 30°C. [86°F.]. The young larvae did not develop at 5°C., but 10 per cent. of the full-grown larvae pupated at this temperature. Young larvae required a considerable amount of water in the soil, 85 per cent. being optimum, and did not develop when the water content was only 35 per cent. Pupation, however, occurred in drier soil. The larval stage lasted about 180 days at 10°C. and 65 days at 25°C. Larvae did not survive in soil covered with water more than 2 ins. deep and died in a day or two at temperatures below −4°C. [24·8°F.]. Pupal development took place at 5°C., but the adults did not emerge at that temperature. The pupal stage lasted 4 days at 30°C. The percentage of adult emergence was highest at 20°C. and fell somewhat even at 25°C.

HARUKAWA (C.) & KUMASHIRO (S.). **Effectiveness of Heating as the Control Method for** *Sitotroga cerealella* **Oliv.** [*In Japanese.*]—*Nogakukenkyu* **27** pp. 72–88. Kurashiki, Japan, March 1937.

All larvae of *Sitotroga cerealella*, Ol., in small lots of wheat (1–1·3 cm. deep) were killed in 90 minutes at 60°C. [140°F.], 50–60 at 70°C. [158°F.], 30 at 80°C. [176°F.] or 15 at 90°C. [194°F.].

INOUYE (M.). **Eine neue** *Chermes*-**Art (Adelgiden) auf Hokkaido.** [A new Species of *Chermes* in Hokkaido.]—*Insecta matsum.* **11** no. 1–2, pp. 75–80, 3 figs. Sapporo, November 1936. [Recd. May 1937.]

Descriptions are given of the young and adult fundatrix and winged gallicolae of *Chermes ishiharai*, sp. n., from spruce in Hokkaido. The fundatrix is found in April on the base of the winter buds of *Picea canadensis*. After three months it becomes adult and lays several hundred eggs, which hatch in about 10 days. The galls formed by the resulting gallicolae burst in June, or, more usually, in July, releasing the nymphs, which moult and become alate adults. Some of these remain on the same tree, while others fly to *Picea sitchensis*. They lay about 12–34 eggs on the needles and then die. The Aphids from these eggs hatch in about 10 days, feed on the needles for a short time and then move to the winter buds, where they hibernate in the first instar.

WATANABE (F.). **Report of the Survey of the Fauna of Forests. 1. Melolonthidae, Coleoptera.** [*In Japanese.*]—104 pp., 26 pls. Aomori, Japan, Bur. For., March 1937.

Descriptions are given of the adults of 65 species of Melolonthids taken in forests in the north of Honshu.

OTANES (F. Q.). **Notes on a Cacao Pod Borer Moth** *Acrocercops cramerella* **Snell.**—*Philipp. J. Agric.* **7** no. 4 pp. 419–424, 2 pls., 2 refs. Manila, 1937.

Acrocercops cramerella, Sn., which has recently been observed attacking cacao in the Philippines [*cf. R.A.E.*, A **25** 125], infests 90 per cent. of the seed-pods in one district. The larvae bore into the pods and tunnel between the seeds, causing them to decay. Descriptions of the various stages of this Tineid and notes on its bionomics in Java are summarised from a work already noticed [**17** 233], and control measures [**1** 57–62] are quoted. No natural enemies have so far been observed in the Philippines, but another species of *Acrocercops*, which attacks *Caesalpinia pulcherrima*, is parasitised by *Elasmus albomaculatus*, Gahan.

SETHI (R. L.), SETHI (B. L.) & MEHTA (T. R.). **Inheritance of Sheathed Ear in Rice.**—*Indian J. agric. Sci.* **7** pt. 1 pp. 134–148, 3 pls., 1 ref. Delhi, February 1937.

The following is substantially the authors' summary: Certain coarse-grained types of rice that yield small crops but are extensively grown in the United Provinces are immune from attack by *Leptocorisa varicornis*, F., on account of the inaccessibility of the ear, which, throughout the life of the plant, remains enclosed in an extension of the leaf-sheath. Crosses were made in 1929 between one of these types and some of the fine rices that yield a heavy crop, but in which the grains are unprotected; the inheritance of the sheathed ear is described. Exposed ears predominated in the F_1 generation. In the F_2 generation, 4 phenotypes were distinguishable, in which the ears were exposed, partly exposed, had the tip exposed, and were enclosed. For convenience in study, the first two were considered as one, and the resulting 3 classes were in the ratio of 49 : 3 : 12. In the F_3 generation, various ratios were obtained and the inheritance appeared complicated and confusing, but the data were satisfactorily explained on a trihybrid hypothesis. In the F_6 generation, true-breeding hybrids were obtained, of which some appear to be of great economic significance.

SUBRAMANIAM (T. V.). **Preliminary Experiments on the Mass-production of *Trichogramma* Parasites for Control against Sugarcane Borers in Mysore.**—*Indian J. agric. Sci.* **7** pt. 1 pp. 149–155, 2 pls., 6 refs. Delhi, February 1937.

The methods used in Mysore to breed *Trichogramma minutum*, Riley, in eggs of *Corcyra cephalonica*, Stn., described in this paper are largely the same as those already noticed [*R.A.E.*, A **20** 153], except that shallow wooden trays of flour in a cupboard were substituted for tin cylinders in rearing the moths, as, in the latter, many larvae were unable to work their way to the surface for pupation. From 1,000 to 1,200 eggs were placed on each card, and the cards were put singly in test-tubes (1 × 4 ins.) containing about 1,000 *Trichogramma* and a small piece of cotton-wool soaked in dilute honey or syrup. The cards were changed daily. The *Trichogramma* parasitised all the eggs on the cards effectively for 3 days.

Eggs turned black on the fourth day after parasitism. About 74·7 per cent. of the resulting adult parasites were females. Without food, they usually died after 3 days, but one female fed on dilute honey survived for 24 days. The average number of host eggs parasitised by one female is 64·3, and the percentage emergence of adult parasites from parasitised eggs 69·07. Parthenogenetic reproduction takes place, the progeny being males, which develop in the same time as individuals bred from fertilised eggs. One generation occupied 7–11 days, according to temperature. The percentage emergence was not affected by storing the parasitised eggs in a refrigerator for 30–35 days, but a longer period of storage decreased it. Larvae of the host sometimes ate parasitised eggs, and adult parasites occasionally became entangled in their webs.

Parasitism of *Diatraea* (*Argyria*) *sticticraspis*, Hmps., on sugar-cane 4–5 weeks old in a 1-acre plot at Mandya [*cf.* **24** 599] increased from 10 per cent. to 92·4 per cent. after the release of 45,000 laboratory-bred *Trichogramma* in 9 batches at weekly intervals from the second week of October 1933, whereas it increased only to 15 per cent. in an uncolonised control area. The weight of sugar-canes harvested per acre was increased by more than 50 per cent. Results in 1934, which largely confirmed those of 1933, and some for 1935 are given in a table.

Ahmad (T.). **Importance of the Study of Insect Ecology in Applied Entomology.**—*Indian J. agric. Sci.* **7** pt. 1 pp. 156–167, 3 figs., 18 refs. Delhi, February 1937.

The author discusses the practical importance of studying the effects of environmental factors on insects and illustrates it from his own work on various species [*R.A.E.*, A **24** 555 ; **25** 43 ; B **25** 13].

Beeson (C. F. C.) & Bhatia (B. M.). **On the Biology of the Bostrychidae (Coleopt.).**—*Indian For. Rec.* (N. S. Ent.) **2** no. 12 pp. 221–323, 19 figs., 3 pls. Delhi, February 1937. Price 5*s.* 6*d.*

The following is the authors' summary : This paper presents the data collected during 22 years on the food-plants, distribution, life-cycles, emergence-periods and other biological features of 69 species of Bostrychidae [*sens. lat.*] occurring in India, Burma and Ceylon. Members of this family are essentially polyphagous and attack trees and shrubs belonging to most natural orders. Eighty-five food-plants are recorded for *Lyctus africanus*, Lesne, and the wood of *Shorea robusta* is attacked by 26 species of Bostrychids. An alphabetical list of 233 species of Indian trees, shrubs, woody climbers, etc., with their borers, is given. The normal life-cycle varies from one year (*e.g.*, *Heterobostrychus aequalis*, Waterh.) to four generations a year (*e.g.*, *Sinoxylon anale*, Lesne), but in all species the period of development of part of a brood is normally prolonged for one or more cycles. Typical emergence-periods are shown by means of graphs. In the majority of species, emergence is most abundant in the hot weather and monsoon, but several species of Lyctinae emerge most abundantly in the autumn and cold season. The importance of wood-starch as an essential food-substance is discussed in connection with pests of bamboos, sawmills and wood-using industries. A general belief that the liability of bamboos to damage by *Dinoderus* is affected by the phase of the moon at the time of felling is scientifically disproved.

[Vavilov (I. F.) & Kotlyar (E. M.).] **Вавилов (И. Ф.) и Котляр (Е. М.). Paradichlorobenzene in the Control of Barn Mites.** [*In Russian.*]—*Social. Grain Fmg* **6** no. 3 pp. 90–93. Saratov, 1936.

An account is given of experiments in the Crimea, made with a view to finding a fumigant against grain mites that would not involve a risk of fire and danger to man and would not necessitate the use of closed buildings or high temperature. At a constant temperature of 20°C. [68°F.], wheat artificially infested with *Tyroglyphus* (*Aleurobius*) *farinae*, DeG., *T.* (*Tyrophagus*) *dimidiatus*, Herm., *Glycyphagus cadaverum*, Schr., and *Rhizoglyphus* sp., was fumigated with paradichlorobenzene at rates of 0·25–1 part to 1,000 parts by weight of grain. All the mites were killed by the highest rate of application in 24 hours, and by all rates in 48. In comparative tests at the same rates of application and temperature, naphthalene gave only a very low percentage of mortality when paradichlorobenzene killed all the mites. The effective results usually obtained with naphthalene in practice are probably due to its repellent action, as, in the authors' experiments, no live or dead mites were found in infested grain treated with it. Paradichlorobenzene evaporated five times as quickly as naphthalene ; the best method of retaining the fumes was to cover the grain with a tarpaulin. Paradichlorobenzene was less effective at low temperatures, the percentage mortalities in comparable tests in 24 hours being 18 at 5°C. [41°F.], 92 at 22°C. [71·6°F.] and 100 at 24°C. [75·2°F.]. In experiments with naturally infested barley, paradichlorobenzene used at the rate of 1 : 1000 by weight of grain killed all the mites in 5 days when mixed with grain stored in sacks and in 10 days when placed in small muslin bags among grain in a closed wooden box. The temperature and relative humidity were 20°C. and 73 per cent. in the first test and 18°C. [64·4°F.] and 83 per cent. in the second. In the latter test, only 20 per cent. of the 50 gm. paradichlorobenzene in each muslin bag had evaporated in 10 days. The germination power of infested wheat and barley was not affected when grain treated with paradichlorobenzene at the same rate was kept in strong wooden boxes for 40 days ; no live mites were found in it on the third day.

[DOBROSMUISLOV (D.) & MEGALOV (A.).] **Добросмыслов (Д.) и Мегалов (А.). Effect of Low Percentage and Standard Calcium Arsenite on Grasshoppers and other Insect Pests.** [*In Russian.*]—*Social. Grain Fmg* **6** no. 3 pp. 94–101. Saratov, 1936.

In view of the high cost of arsenic in the Russian Union, attempts have been made to produce effective insecticides with a low arsenic content by coating the particles of an inert carrier with a thin layer of the poison [*cf. R.A.E.*, B **22** 38], so that the latter would be more readily absorbed by the insect. Since promising results were obtained in preliminary tests of such preparations, experiments on a larger scale were carried out in the Province of Saratov in 1935 to determine whether a dust coated with calcium arsenite to contain 38 per cent. As_2O_3 could be substituted for the standard calcium arsenite containing 71·7 per cent. As_2O_3.

Tests by a modified sandwich method [*cf.* A **19** 698] of the dosages required to give 50 per cent. mortality of the insects showed that the diluted calcium arsenite was only 20 per cent. less toxic than the standard dust to adults of *Calliptamus italicus*, L., and 37 per cent. less toxic to larvae of *Barathra brassicae*, L. In further tests, fourth-instar hoppers of *C. italicus* were placed on dusted plants for 24 hours and then on untreated ones. Complete mortality was caused in 4 days by each of the calcium arsenite preparations used at the rate of 9 lb. per acre, and 95 per cent. by a magnesium arsenite dust containing 25 per cent. As_2O_3, whether it was applied at the rate of 4½ or 9 lb. per acre. In field tests on plots severely infested with *C. italicus* and treated with 9 lb. dust per acre, the percentages of mortality of hoppers of the third and fourth instars and of adults in 2 days were 80, 87 and 54·2, respectively, with the diluted calcium arsenite and only 73, 75 and 37·3 with the standard one. When, however, hoppers were caged on the dusted plants, the standard dust was slightly the more effective.

In field experiments against *Sitona* sp. on lentils, the diluted and standard calcium arsenites gave averages of 45·9 and 52 per cent. mortality at comparable rates of application. The dusts sometimes scorched the lentils.

KUNTZE (R.). **Eine kritische Uebersicht der in Polen durch den Pflanzenschutzdienst in den Jahren 1919–1933 verzeichneten schädlichen Coleopterenarten.** [A critical Survey of the Species of Coleoptera recorded in Poland by the Plant Protection Service in the Years 1919–33.] [*In Polish.*]—*Roczn. Ochr. Rośl.* **3** no. 2 pp. 1–116, 6 pp. refs. Warsaw, 1936. (With a Summary in German.)

This is a review of data published in 1919–33 [*cf. R.A.E.*, A **22** 333; **24** 262, etc.] on Coleoptera attacking cultivated plants and forest trees in Poland. Brief notes are given on the distribution, frequency of occurrence and economic importance of 275 species, which are dealt with under their families. Of these, 19 had been erroneously recorded as pests, owing to misidentification or inaccurate observation; and only 67, which are separately listed, are of much economic importance. Notes are also given on 43 additional beetles that had been recorded only under their generic or family names, and the probable specific identity of 30 of them is suggested; of these, however, only two are of importance as pests. Finally, an annotated list is given of 195 species of beetles that had not been recorded by the Plant Protection Stations in Poland, but of which 173 are mentioned in Sorauer's text-book [**17** 256] as occurring there and 22 have been observed by the author. Most of these are of little economic importance. An index to the names of the beetles is appended.

RUSZKOWSKI (J. W.) & GAWINOWA (J.). **Control of *Hylemyia brassicae* Bché. Results of five Years experiments in Mory near Warsaw, Poland.** [*In Polish.*]—*Roczn. Ochr. Rośl.* **3** no. 2 pp. 136–167, 42 refs. Warsaw, 1936. (With a Summary in English.)

Phorbia (*Hylemia*) *brassicae*, Bch., is an important pest of cabbage and cauliflower in Poland, and field experiments on its control were carried out during 1931–35 near Warsaw in special plots of cauliflower. A detailed account of them is given and the results are shown in tables. The best control was obtained by pouring a 0·1 per cent. solution of mercury bichloride round the bases of the plants [*cf. R.A.E.*, A **23** 301], two or three applications at the rate of about 1 pint to 10 plants being made at intervals of about a week, beginning as soon as oviposition was noticed, usually a few days after planting out. Carbolic acid with soap or lime and water was less effective. Watering the seedlings at weekly intervals with 0·2 per cent. tar distillate did not significantly reduce the percentage of plants infested, but reduced the percentage killed to 8·7, as against 23·6 in the untreated beds. Chopped straw placed around the plants [*cf.* **13** 378] greatly reduced the loss in the treated plots and is considered a practical means of control. Immersing the roots of seedlings in mercury bichloride solution before planting out [*cf.* **16** 413] resulted in an increase of infestation, possibly because it retarded the development of the plants. Other measures that proved of little or no value were immersing the roots in quassia extract, and the use as repellents of paradichlorobenzene, naphthalene or a mixture of equal parts of tobacco dust and lime. Special experiments, carried out during one year only, showed that the date of sowing and transplanting cauliflowers definitely affects the degree of infestation by the fly [*cf.* **17** 142].

Ripper (W.). **Schaden und Bekämpfung der Blattrandkäfer (Vorläufige Mitteilung).** [Injury by and Control of *Sitona* spp. (Preliminary Communication).]—*Neuheiten PflSch.* **30** no. 2 pp. 55–58, 1 fig. Vienna, April 1937.

Sitona lineata, L., and *S. crinita*, Hbst., are serious pests of peas and clover in Austria. The overwintered adults attack the germinating pea plants in spring, often destroying or stunting them. They lay eggs on the leaves, and the larvae feed first on the bacterial nodules of the roots and then the roots themselves. The new adults appear during and after the pea harvest, particularly in July, and migrate to *Robinia*, red clover, lucerne and vetch. Only a few find their way to late crops of peas. On lucerne they occur together with *S. puncticollis*, Steph., *S. humeralis*, Steph., *S. inops*, Gyll., and *S hispidula*, F., which infest this crop from spring onwards. During the heat of summer, the beetles shelter on the ground by day and feed only at night. They hibernate on perennial leguminous plants, from which *S. lineata* and *S. crinita* fly to the pea fields in March.

If a severe attack is expected in spring, a trap crop of winter peas should be sown in September. The leaves will then be large enough at the spring migration time to be treated with an insecticide such as calcium arsenate dust. On lucerne or clover, the beetles can be caught at night by a suitable machine ; a horse-drawn type, in which a horizontal board sweeps them into a bag, is illustrated.

Der Luzernekäfer (Kleewurm). [The Lucerne Beetle (Clover Worm).] —*Landwirt* **5** no. 7 pp. 49–50. Novisad, 1937. (Abstr. in *Neuheiten PflSch.* **30** no. 2 p. 68. Vienna, April 1937.)

Phytodecta fornicata, Brügm., has four generations a year on lucerne in Jugoslavia. It is sometimes controlled by spreading a layer of straw over the field immediately after the first cutting and burning it. The plants become green again after about 8 days.

Janson (—). **Ein heimtückischer Schädiger der Azaleen.** [An injurious Pest of Azaleas.]—*Landwirt* **5** no. 6 pp. 47–48, 1 fig. Novisad, 1937. (Abstr. in *Neuheiten PflSch.* **30** no. 2 p. 69. Vienna, April 1937.)

In Jugoslavia, the larvae of *Otiorrhynchus sulcatus*, F., attack the root collar and roots of azaleas kept indoors in winter or early spring, and the adults feed on the leaves at night.

Kovačevič (Ž.). **Die San José-Laus in Jugoslawien.** [The San José Scale in Jugoslavia.]—*Wien. landw. Ztg* **87** p. 53, 1937. (Abstr. in *Neuheiten PflSch.* **30** no. 2 pp. 69–70. Vienna, April 1937.)

Records are given of areas in the northern part of Jugoslavia in which *Aonidiella* (*Aspidiotus*) *perniciosa*, Comst., has been found. Some of the infestations have been established for several years. The scale has three generations a year in Jugoslavia, of which the last is not completed in some years. Apricots are more resistant to attack than other fruit trees. If a recent infestation is discovered, the trees are at once burned. In the case of old infestations, sprays of tar distillate or oil emulsion are used for control.

Roos (K.). **Das Auftreten des Buchenbockes** (*Cerambyx scopolii* **Füssl.**) **an Kirschbäumen.**] The Occurrence of *C. scopolii* on Cherry Trees.]—*Schweiz. Z. Obst- u. Weinb.* **46** pp. 54–56, 1 fig., 1937. (Abstr. in *Neuheiten PflSch.* **30** no. 2 pp. 70–71. Vienna, April 1937.)

The injury done by *Cerambyx scopolii*, Füssl., was studied in the cherry orchards of the Swiss canton of Basel. The beetle is polyphagous, and only attacks cherry trees if it is able to oviposit in untreated wounds. Small larvae are found in the bark and large ones in the wood, complete development requiring three years. Flight and oviposition occur from May to July.

Wiesmann (R.). **Untersuchungen über die Biologie und Bekämpfung der Erdbeermilbe,** *Tarsonemus fragariae,* **H. Zimmermann.** [Investigations on the Biology and Control of the Strawberry Mite, *T. pallidus*, Banks.]—*Landw. Jb. Schweiz* **51** no. 3 pp. 335–348, 1 fig., 14 refs. Bern, 1937.

Tarsonemus pallidus, Banks (*fragariae*, Zimm.) has long been a serious pest of strawberries in Switzerland. Notes are given on its morphology and bionomics [*cf. R.A.E.*, A **21** 371 ; **25** 121] and on the crinkling of the leaves caused by it, and the measures suggested or employed for its control in various countries are reviewed in some detail. The best results have been obtained by treating the dormant plants with hot water [**22** 234, 581 ; **25** 121, etc.], but as the process was thought to be somewhat complicated, tests were made with 10 fumigants, some of which gave fair results. Further tests were made in September and November with a Swiss preparation sold as S-gas. This is supplied in liquid form in ampules, its active constituent being methyl bromide, which boils at 4·5°C. [40·1°F.]. Methyl bromide is a rather violent respiratory poison, but is easy to apply with safety to strawberry runners, which can be fumigated in any tightly closed metal box in which the ampule is broken. A strength of 2 volumes per cent. of the gas killed all the mites and eggs in 6 hours at 15°C. [59°F.]. Fumigation would not be effective at lower temperatures. At 18°C. [64·4°F.], the time could be reduced to 4 hours, but no harm was done to the plants by fumigating for 6. All stages except the eggs were killed in 6 hours with 0·75 vols. per cent. at 18°C. Atmospheric humidity did not affect S-gas, which acted perfectly in fully saturated air. No injury to the plants occurred, even with a strength of 2·4 volumes per cent.

Ott (A.) & Pieri (A.). **A proposito della tignola orientale del pesco.** [Regarding the Oriental Peach Moth.]—*Note Fruttic.* **15** no. 4 pp. 53–60. Pistoia, April 1937.

Part of a paper regarding the incidence of *Cydia molesta*, Busck, in Georgia [*R.A.E.*, A **18** 217] is translated, and the first author concludes from it that infestation of peach in Italy would be reduced if apple and other food-plants were kept at a distance from peach orchards, varieties of peach that mature their fruit at the time that the fifth generation appears (in Tuscany [*cf. R.A.E.*, A **24** 124]) were eliminated, and the growth of peach shoots at the end of summer was prevented.

The second author states that, in the province of Pistoia, *C. molesta* renders it uneconomic to grow varieties of peach ripening in September. He found that the degree of infestation of a given variety varies with the position of the orchard, severe attack being apparently due to the development of the late generations being favoured by the presence of apples and late-maturing peaches and pears and of nursery peach trees that provide tender shoots in autumn, and, indirectly, by irrigation.

Pussard (R.). **La teigne de la lavande** (*Sophronia humerella* **Schiff.**).—*C. R. Acad. Agric. Fr.* **23** no. 11 pp. 387–395, 3 refs. Paris, 1937.

A serious reduction of the crops of lavender (*Lavandula vera*) in plantations in the Basses-Alpes has been caused in recent years by the Tineid, *Sophronia humerella*, Schiff. The moths begin to oviposit on the plants early in July, and the eggs, which are laid singly or in groups of 2–6 under shreds of bark, hatch in about 10 days. The newly hatched larvae spin small white circular cocoons in sheltered places on the old stems and hibernate there. In the early spring, they begin to feed on the buds, eating the stems of the future flowers, and in severe infestations destroying the whole crop. Later they web several leaves together and continue to feed in the shelter so formed. In 1936, the worst damage took place about 19th May, and the larvae began to pupate in their shelters early in June. The moths began to emerge in the second half of June and disappeared during August. Some unidentified Hymenopterous parasites and the Tachinid, *Nemorilla floralis*, Fall., var. *maculosa*, Mg., were reared from this Tineid in June.

In experiments on control, 19 different dusts and sprays were tested. Applications were made in mid-April when the larvae were still eating the buds and before they had begun to web the leaves together. Excellent results were obtained with a spray of 0·3 gals. nicotine sulphate (containing 50 per cent. nicotine [*cf. R.A.E.*, A **13** 93]), 10 lb. white soap and 0·8 lb. sodium carbonate in 100 gals. water. Of the other insecticides, which were much less effective, the best was a spray of 9 lb. synthetic cryolite, with an adhesive, in 100 gals. water; the best of the dusts was barium fluosilicate and talc, 1 : 4. Arsenical sprays were practically useless.

Börner (C.) & Schilder (F. A.). **Die Verbreitung der Reblaus in Deutschland nach dem Stande des Jahres 1936.** [The Distribution of *Phylloxera* in Germany in 1936.]—*Beil. NachrBl. dtsch. PflSchDienst* **17** no. 5, 11 pp. Berlin, May 1937.

Phylloxera was found on grape vines in 66 new localities in 1936 [*cf. R.A.E.*, A **24** 79]. Of the specimens received, 25 per cent. were the form with a short proboscis, which occurred in 5 instances on the leaves and in the other cases on the roots, including those of grafted vines as well as of hybrids. The export of root stocks from certain districts is subject to control to prevent the spread of this form. The form with a long proboscis has also spread, but no infestation of leaves by it was observed.

Eidmann (H.). **Zur Theorie der Bevölkerungsbewegung der Insekten.** [A Contribution to the Theory of Population Fluctuation in Insects.]—*Anz. Schädlingsk.* **13** nos. 3–4 pp. 25–26, 47–52, 2 figs. Berlin, March–April 1937.

The fluctuation in populations of insects may be studied by two complementary methods, that of physiological experiments in the laboratory and that of investigation of population density in nature. The latter method, which is here discussed, involves the difficulty of elucidating the complex action of environmental factors and of surveying small and very small population densities. The area of distribution of the insect to be studied should be divided into at least three zones, according to its abundance. Population figures should be obtained in all these zones, and between, as well as during, outbreaks in the densely populated areas. Fluctuations in the prevalence of allied species should also be considered. To obtain comparable data for a study lasting several years, it is necessary to work with the same developmental stage, to prevent variation within a generation from obscuring the main line of population fluctuation.

Instances of a periodicity of 10–12 years in the occurrence of outbreaks have led to attempts to connect them with sunspots ; but the author suggests that the environment in the areas of chief injury of a given insect is so favourable that the coefficient of its increase is normally higher than one, with the result that its numbers rise progressively over a number of years. When, however, they reach a certain high level, they fall, often with great suddenness. In future, more attention will be paid to the cause of such a fall rather than to causes producing the increase, and it is suggested that the increase itself is responsible through the phenomena at present generally called overpopulation and that this affords a better explanation of periodicity than the sunspot theory.

Sattler (F.). **Der Apfelblütenstecher** (*Anthonomus pomorum* **L.**). **Vorläufige Mitteilung über die Versuchsjahre 1935 und 1936.** [The Apple Blossom Weevil, *A. pomorum*. A preliminary Communication on the experimental Years 1935 and 1936.]—*Anz. Schädlingsk.* **13** nos. 3–4 pp. 31–32, 52–55, 6 figs., 10 refs. Berlin, March–April 1937.

The author disagrees with the view that *Anthonomus pomorum*, L., is not injurious to apple in Germany [*cf. R.A.E.*, A **19** 615, etc.] and states that it has caused considerable loss of crop in recent years. Laboratory and field experiments made in 1935 and 1936 showed that the weevils can be killed by spraying in spring when they are feeding prior to oviposition. Stomach poisons proved ineffective because there was little feeding on the surface of the leaves and buds, but contact insecticides gave satisfactory results. Those used are not specified. It is concluded from experience in spraying more than 3,000 trees in Baden, Württemberg and Hesse that good control of the weevil can be obtained if, after the customary winter treatment with a tar distillate, a contact poison is added to the usual pre-blossom spray. If the pre-blossom period is protracted, two applications may be necessary.

BARTH (—). **Das Auftreten zweier Speckkäferarten** (*Dermestes vulpinus* **Fbr. und** *peruvianus* **Lap.**) **als Kakaoschädlinge.** [Two Lard Beetles as Pests of Cacao.]—*Anz. Schädlingsk.* **13** no. 4 p. 56, 3 refs. Berlin, April 1937.

Larvae and adults of *Dermestes* were observed infesting Venezuelan cacao that had been stored for 14 days in a German custom-house on the Rhine. They fed on cacao beans that had already been damaged in some way, but were apparently unable to attack sound ones. Most of the beetles were *D. vulpinus*, F., but 2 in a batch of 150 were *D. peruvianus*, Lap. It could not be ascertained how the cacao became infested.

BUHL (C.) & MEYER (E.). **Ein neues Gerät zum Rapskäferfang.** [A new Apparatus for catching Rape Beetles.]—*Z. PflKrankh.* **47** no. 1 pp. 34–38. Stuttgart, 1937.

Insecticides have not given satisfactory results against *Meligethes aeneus*, F., and *Ceuthorrhynchus assimilis*, Payk., on rape in Germany, and various types of apparatus hitherto used to catch the beetles by sweeping them from the plants have also proved inadequate. A description is given of an improved pattern in which a pair of boards fixed at an angle to each other sweep the plants in two adjoining rows and knock them together so that the beetles are jarred into a pan suspended below and containing an insecticide. Two operators walking abreast carry a bar to which three of the pairs of boards are attached, so that six rows of plants are swept at a time. It is stated that an average of 80 per cent. of the beetles was caught.

KAUFMANN (O.). **Untersuchungen über die Zusammensetzung und Veränderung der Parasitengarnitur der Rübenfliegenpuparien in Deutschland.** [Investigations on the Composition of and Variation in the Parasite Fauna of the Beet-fly Puparia in Germany.]—*Z. PflKrank.* **47** no. 2 pp. 75–86, 2 figs., 1 map, 8 refs. Stuttgart, 1937.

The beet-fly, *Pegomyia hyoscyami*, Panz., has at least three complete generations a year in Germany, in each of which its parasites compete with one another. They differ in their resistance to rainy weather, though all are more susceptible to it than their host. A detailed account is given of the results of breeding parasites over a period of ten years from more than 80,000 puparia of the third generation of the fly collected from waste water from sugar factories. The prospects of survival of the most important German parasites are discussed on the basis of existing knowledge of life-history and climate, and the observed data are recorded.

The following is taken largely from the author's summary: It is shown that both the percentage of parasitism and the relative abundance of individual species are subject to considerable seasonal and, especially, local variation. According to these investigations, the Ichneumonid, *Phygadeuon pegomyiae*, Hbm. (which oviposits in the larvae in the beet leaves and in the pupae in the ground) and the Braconid, *Opius spinaciae*, Thoms. (which oviposits only in the larvae) are the principal parasites in Germany. *Diachasma* (*O.*) *bremeri*, Bengts., *O. fulvicollis*, Thoms., and *O. nitidulator*, Nees, were of some importance, but *O. ruficeps*, Wesm., and the other parasites observed were not. In a majority of cases examined, the percentage of parasitism varied inversely with the amount of rainfall in August and September. In years not conforming to this rule, the most common parasite was usually *O. spinaciae*, which increases chiefly at the expense of *Phygadeuon*. In 1930 there was a remarkable change in the composition of the parasite fauna owing to a sudden increase of *O. spinaciae*. The June temperatures were abnormally high over wide areas, and a rather large amount of rain during the third flight period affected this Braconid less than *P. pegomyiae*. In the neighbourhood of Breslau (Silesia), *O. spinaciae* predominated over all other parasites in 1932–34, the temperatures in these years being repeatedly abnormally high in June, July and August. In each year, there were distinct areas in which one or other of the important parasites was predominant. Thus in 1930, *P. pegomyiae* predominated in areas with the lowest average rainfall of 237·8 mm. in June–September (the main flight periods of the successive generations of the parasites) and *O. spinaciae*, *O. fulvicollis* and *O. nitidulator* in areas with rainfalls of 259·5, 295 and 356·7 mm., respectively. At room temperature in the laboratory, these parasites emerged in the sequence given, and *D. bremeri* preceded *O. spinaciae*.

LANGENBUCH (R.). **Massnahmen zur Verhütung der Beschädigung des Kartoffelkrautes durch die Arsenspritzungen gegen den Kartoffelkäfer.** [Measures for the Prevention of Injury to Potato Plants in the Course of Arsenic Spraying against the Potato Beetle.]—*Z. Pfl.Krankh.* **47** no. 2 pp. 98–101, 3 figs. Stuttgart, 1937.

Spraying with an arsenical insecticide is the chief measure taken against *Leptinotarsa decemlineata*, Say, in Germany [*R.A.E.*, A **25** 70, etc.]. The author discusses the mechanical injury done to the plants by the horse-drawn spray units and by the operators carrying knapsack sprayers, and suggests means for minimising it.

KÖRTING (A.). **Ueber die phytopathogene Bedeutung von Getreidethysanopteren. Eine Erwiderung.** [On the phytopathogenic Importance of Thysanoptera living on Cereals. A Reply.]—*Z. Pfl.Krankh.* **47** no. 2 pp. 102–110, 14 refs. Stuttgart, 1937.

The author refers to Hukkinen's survey of the question of the relation of Thysanoptera to "white-ear" of cereals and grasses [*R.A.E.*, A **23** 261], which included criticisms of various passages in one of his papers [**18** 697]. He discusses them and maintains his conclusions, pointing out that they apply solely to the Thysanoptera and cereals investigated by him.

BLUNCK (H.). **Der Stand der Maikäferfrage.** [The Position of the May Beetle Question.]—*Z. PflKrankh.* **47** no. 5 pp. 257–277, 2 graphs, 3 pp. refs. Stuttgart, 1937.

The larvae and adults of *Melolontha* spp. are important pests of plants in wide areas in Germany. Measures for their control are reviewed from the literature; hand collection is the only one considered to offer some prospect of success. Collection of the larvae can be carried out by individuals, but that of the adults requires general co-operation. It must begin at the onset of the chief flight period, and all trees on which the beetles are likely to feed must be visited several times within a fortnight. The work must continue as long as the beetles are numerous. It is not known, however, that it will be effective, and investigation of its economic justification is desirable prior to 1938, which is expected to be the next year of extensive flight.

Hollrung (M.). **Das Sammeln und Vernichten von Falläpfeln als Mittel gegen** *Carpocapsa*. [The Collection and Destruction of fallen Apples as a Measure against *Cydia pomonella*.]—*Z. PflKrankh.* **47** no. 5 pp. 301–305. Stuttgart, 1937.

Data obtained from 1925 to 1929 at Halle (central Germany) on the relative infestation of different varieties of apple by *Cydia* (*Carpocapsa*) *pomonella*, L., and on the number of larvae present in fallen fruit are tabulated. Of over 34,000 apples examined, 48·1 per cent. were infested. In 1925, the infestation amounted to about 85 per cent. There was no very pronounced preference for any of 12 varieties, but the percentage infestation of one variety was always comparatively low (35·1–42·7) and that of another comparatively high (59·4–77·5). Less than 20 per cent of the fallen apples contained larvae, even when they were collected daily in July and August. Quite as many of the infested fruits had been entered at the side as through the calyx cavity. Quite young larvae were found early in August, which suggests that two generations a year may occur in central Germany. It is evident that neither the collection of fallen fruit nor the use of a calyx spray alone will give adequate control.

Sellke (K.). **Biologische und morphologische Studien an schädlichen Wiesenschnaken (Tipulidae, Dipt.).** [Biological and morphological Studies on harmful Tipulids.]—*Z. wiss. Zool.* **148** no. 4 pp. 465–555, 43 figs., 101 refs. Leipzig, November 1936. [Recd. June 1937.]

An account is given of investigations on the biology and morphology of *Tipula paludosa*, Mg., *T. czizeki*, de Jong, and *T. oleracea*, L., using larvae obtained from various parts of northern Germany, and the results are compared with those recorded in the literature. *T. paludosa* and *T. czizeki* have one generation a year, the adults of the former occurring in August–September, and those of the latter in September–October. It is not known whether *T. oleracea* has two generations, but the adults are found in May–June and September–October. It is rare in northern Germany. The other species are common, the larvae occurring together. Adult Tipulids emerge from pupae only at night and oviposit in lawns or damp soil. The number of eggs deposited by one female ranged from a maximum of 500 to a minimum of 36. Eggs of *T. paludosa* develop without a diapause in August–September; those of *T. czizeki* hibernate and hatch in April, though winter rest is not obligatory. In captivity at a temperature of 18·5–21·9°C. [65·3–71·42°F.], hatching occurred without hibernation.

König (W.). **Biologische Studien über** *Ptinus tectus* **Boield.** [Biological Studies on *P. tectus*.]—*Z. wiss. Zool.* **148** no. 4 pp. 556–599, 35 figs., 54 refs. Leipzig, November 1936. [Recd. June 1937.]

Ptinus tectus, Boield., has become widely distributed in Germany since 1916 [*cf. R.A.E.*, A **20** 493]. The bulk of the material used in the investigations recorded in this paper was obtained from Berlin, where the beetle was found infesting poultry food containing dried yeast, bran and crushed crabs in a heated store-room. All stages are fully described. The larvae are omnivorous, materials of various kinds being devoured, or spoiled by the production of silk, the abundance of which depends on the water content of the larvae. There are 3 moults, but it was impossible to determine the duration of each instar. Pupation takes place in a cocoon, and the pupal stage lasts about a month.

GÄBLER (H.). *Otiorrhynchus pupillatus* **Gyll. a.** *subdentatus* **Bach als Forstschädling.** [*O. subdentatus* as a Forest Pest.]—*Tharandt. forstl. Jb.* **88** no. 4 pp. 294–296, 1 fig., 3 refs. Berlin, 1937.

In May, the tips of twigs of *Salix caprea* in the district of Tharandt, Saxony, were seen hanging down, subsequently dying and dropping off. Inspection revealed the presence of adults of *Otiorrhynchus subdentatus*, Bach, and when some of these weevils were kept in a cage, they caused the same injury to twigs of *S. caprea* and basket willow (*S. viminalis*). Eggs were seen in the cage on 10th June. Examples of *O. subdentatus* and *O. hirticornis*, Hbst., were received from two other districts in Saxony, where they were stated to have caused injury to beech saplings.

GÄBLER (H.). **Rüsselkäfer als Kätzchenschädlinge der Weide und Birke.** [Weevils as Catkin Pests of Willow and Birch.]—*Tharandt. forstl. Jb.* **88** no. 4 pp. 296–299, 1 fig., 7 refs. Berlin, 1937.

Adults of *Phyllobius viridicollis*, F., were found in mid-May in the district of Tharandt, Saxony, in the ovules of catkins of *Salix caprea* and *S. viminalis*, and also feeding on the leaves of the willows and of raspberries nearby. Eggs were laid in the ovules and hatched in cages in mid-June. The larvae immediately left the catkins; under natural conditions, they probably develop in the ground, as most of the catkins have fallen by the time they hatch. *Barypithes pellucidus*, Boh., was found gnawing the anthers of fallen catkins of *Betula luteola.*

STOREY (H. H.). **A new Virus of Maize transmitted by** *Cicadulina* **spp.**—*Ann. appl. Biol.* **24** no. 1 pp. 87–94, 1 pl., 9 refs. Cambridge, February 1937.

The occurrence in Tanganyika is recorded of a virus producing a transitory diffuse mottling in maize. The symptoms are distinguishable from those of other viruses known to affect this plant. Transmission experiments showed that among leafhoppers collected in the field, *Cicadulina mbila*, Naudé, *C. zeae*, China, and *C. storeyi*, China, carried the virus. These species are also vectors of streak disease of maize, and some of the individuals collected were carrying both viruses; the presence of one did not affect transmission of the other. The race of *C. mbila* that transmits the streak virus [*cf. R.A.E.*, A **24** 649] also transmitted the mottle virus; the race that does not transmit the streak virus (inactive race) transmitted the mottle virus in only 4 cases out of 120. Inactive insects that transmitted the mottle virus did not transmit streak, even from a mixed infection. An inactive race of *C. zeae* gave 1 infection with the mottle virus in 19 test plants.

The presence of mottle virus in a plant did not prevent the development of the streak virus, nor were the ultimate symptons of one affected by the other. In some circumstances, however, the mottle virus caused a significant delay in the development of the symptoms of streak disease.

MacGill (E. I.). **The Biology of Thysanoptera with Reference to the Cotton Plant. VIII. The Relation between Variations in Temperature and the Life Cycle.**—*Ann. appl. Biol.* **24** no. 1 pp. 95–109, 8 graphs, 6 refs. Cambridge, February 1937.

In continuation of previous experiments [*cf. R.A.E.*, A **20** 60], control larvae of *Thrips tabaci*, Lind., were kept at 27°C. [80·6°F.] (the optimum temperature for development) and other batches were subjected to temperatures of 38°C. [100·4°F.] (nearly the highest at which development takes place), 31°C. [87·8°F.], 8°C. [46·4°F.] (within the lower limit of development) or —4°C. [24·8°F.] (below the lower limit) for regulated periods at known relative humidities before being allowed to complete their development at 27°C. The following is substantially the author's summary: Exposure to 38, 31, 8, and —4°C. for periods varying from 1 to 96 hours has a marked effect on the survival of the insects. At 100 per cent. humidity, exposure to 38 and 31°C. gives a higher rate of mortality than exposure to 8 and —4°C.; at 82 per cent., 38 and —4°C. are the least favourable temperatures; and at 75 per cent., —4°C. is the most unsuitable. In some conditions more larvae survive after a long exposure than after a shorter one, which suggests that at certain points in their life-cycle the insects are particularly sensitive to changes in their environmental conditions. From these experiments, it does not appear that relative humidity has a marked effect on the length of the life-cycle. Exposure to low temperatures has a more constant effect on the length of the larval stage than exposure to high ones; exposure to —4°C. retards development for a longer time than the duration of the exposure, and exposure to 8°C. for a shorter time. The length of the life-cycle varies with the absolute humidity of the atmosphere; vapour pressures below 15 mm. have a retarding influence on development, while those between 15 and 25 mm. accelerate development.

Fisher (R. C.). **The Genus** *Scolytus* **in Great Britain, with Notes on the Structure of** *S. destructor* **Ol.**—*Ann. appl. Biol.* **24** no. 1 pp. 110–128, 14 figs., 22 refs. Cambridge, February 1937.

Six species of *Scolytus* occur in Britain, where they appear to be confined to hardwoods. *S. scolytus*, F. (*destructor*, Ol.), *S. multistriatus*, Marsh., *S. intricatus*, Ratz., *S. mali*, Bechst. (*pruni*, Ratz.), and *S. rugulosus*, Ratz., are all found commonly only in the southern counties of England, although they have been recorded rarely as far north as Northumberland and Durham. *S. ratzeburgi*, Jans., has been found only in Scotland [*cf. R.A.E.*, A **13** 293]. The morphology of all stages and anatomy of the adults of *S. scolytus* are described in detail, and a key to the British species of *Scolytus* is appended.

PARKIN (E. A.) & BUSVINE (J. R.). **The Toxicity of Hydrogen Cyanide to certain Wood-boring Insects.**—*Ann. appl. Biol.* **24** no. 1 pp. 131–143, 2 graphs, 6 refs. Cambridge, February 1937.

An account is given of experiments on the susceptibility to hydrocyanic acid gas of larvae of *Lyctus* sp. and *Anobium punctatum*, DeG., and adults of *Lyctus brunneus*, Steph., all removed from wood. All fumigations were at a relative humidity of 45 per cent., and control batches underwent analogous treatment with conditioned air. Larvae were subsequently examined twice a week for more than 4 weeks, and beetles for about 18 days ; they were kept at the temperature at which they had been fumigated. The concentrations per litre of HCN that gave complete mortality of larvae of *Lyctus* in 1 and 6 hours were about 18 and 4 mg., respectively, at 20°C. [68°F.], and about 14 and 2½ mg. at 25°C. [77°F.]. Only 12 per cent. of the larvae surviving treatment at 20°C. had not recovered within the first 10 days, and in the control batches in the same period only 18 per cent. died ; at 25°C., 30 per cent. of the larvae surviving treatment had not recovered in 10 days and 35 per cent. of the controls died in that period. At 25°C., the concentrations causing complete mortality of *Lyctus* adults and *Anobium* larvae after periods of 1 hour were about 21·5 and 18 mg., respectively, and after 6 hours about 2·75 and 2 mg. In the experiments with *Anobium* larvae, the survivors had all recovered within 15 days, while 8·5 per cent. of the controls had died in the same period. The larger *Lyctus* larvae were more resistant than the smaller, 33·9 per cent. of those 4–5 mm. long surviving and 10·2 per cent. of those 1–2 mm. long. A few pupae of *Lyctus* that were exposed to 4 concentrations of HCN for 1 hour at 20°C. had a resistance about equal to that of the larvae. The results for all concentrations and periods of exposure showed that *Lyctus* larvae were less resistant to HCN than either *Anobium* larvae or *Lyctus* beetles. Investigation into the cause of the high death-rate among the control batches showed that the handling of the larvae during the examinations twice weekly was injurious, and deaths appeared to be associated with difficulties in moulting.

The working effect of the gas, as calculated from the concentration and time of exposure by Haber's formula [*R.A.E.*, A **23** 121, etc.], was not constant, but the figures did not show any consistently divergent trend. Further work is now required to establish the amount of HCN that must be applied outside a piece of wood in order to obtain the required concentration round the insect inside the wood.

NEEDHAM (N. V.). **A Bacterial Disease of *Aphis rumicis* Linn., apparently caused by *Bacillus lathyri* Manns & Taubenhaus.**—*Ann. appl. Biol.* **24** no. 1 pp. 144–147, 11 refs. Cambridge, February 1937.

An organism culturally resembling *Bacillus lathyri* was isolated from individuals of *Aphis rumicis*, L., that belonged to a colony collected from broad beans in England and kept on the same food-plant in a glasshouse. The colony had shown evidence of disease, as members of it died within 24 hours when removed from the food-plant. Similar bacilli were not isolated from normal colonies of the same Aphid. Two lots of normal Aphids were dipped in sterile water and in a suspension of the bacillus isolated from infected Aphids, respectively, and then transferred to broad bean plants, viviparous females being transferred after 2 days to fresh plants. After 10 days the progeny of those dipped in the bacterial culture was found to be infected; death occurred rapidly on removal from the plant, and the insects yielded bacilli having the same characteristics as the organism originally isolated. Aphids of the control series survived for 4 days after removal from the food-plant, and did not contain the infecting organisms.

B. lathyri is said to be associated with "chocolate-spot" of broad beans, but inoculation of broad beans in a greenhouse with the organism isolated from the Aphids did not give rise to typical symptoms of this disease, although considerable necrosis occurred at the site of inoculation. No necrosis was produced by inoculation with organisms isolated from uninfected Aphids, or where the leaves were punctured with a sterile needle. As previous workers have obtained *B. lathyri* from only a small proportion of diseased plants examined, it is considered possible that it is primarily the cause of a disease of Aphids that may, under suitable conditions, produce diseases in plants. All plants from which it has been isolated are especially subject to infestation by Aphids.

The Problems raised by the Woolly Aphis of the Apple—A Case for Team Research.—*Ann. appl. Biol.* **24** no. 1 pp. 169–210, 5 pls., 6 figs., many refs. Cambridge, February 1937.

The following papers of entomological interest are included in this symposium: The Control of Woolly Aphis, by R. M. Greenslade (pp. 184–187) [*cf. R.A.E.*, A **22** 584; **23** 427; **24** 653]; Entomological Technique, by A. M. Massee (pp. 195–198), which comprises a brief account of the methods employed in infesting seedlings with the woolly apple aphis (*Eriosoma lanigerum*, Hsm.) and in testing apple stocks and seedlings for their resistance to it [*cf.* **19** 637; **24** 641, etc.]; and Studies on Possible Causes of Immunity, by W. A. Roach (pp. 206–210), which reviews investigations on the biological and chemical aspects of immunity [*cf.* **11** 537; **13** 15; **19** 636, 637; **22** 584].

ANLEY (G.). **The Primula or Auricula Root Aphis. A simple Cure.**—*J. R. hort. Soc.* **62** pt. 4 pp. 166–172, 2 pls. London, April 1937.

Pemphigus (*Pentaphis*) *auriculae*, Murr., is widely distributed on *Primula* spp. in England and other countries in Europe, and has recently been observed in Japan. It infests the roots and collar of the plant, and secretes a waxy substance that forms a woolly protective covering. Infestation of the roots results in yellowing and malformation of the leaves and interruption of growth. Its control on plants grown in pots is difficult, as attacks tend to recur at frequent intervals and constant root disturbance would injure the plants, while any liquid insecticide used must contain a wax solvent or it will not reach the Aphids under their woolly covering. The method here described, however, has given effective control during the past two years.

As soon as possible after flowering, the roots of infested plants are shaken free of soil, and immersed up to the collar for 10 minutes in white oil emulsion (1 teaspoonful Volck in 1 pint water). They are then rinsed, gently dried with a cloth, dusted with silver sand and repotted, perforated zinc being placed over the drainage holes. The pots should be thoroughly scalded. All old soil and drainage material should be covered with crystals of paradichlorobenzene in a closed metal vessel and left for a week before being placed on the compost heap, or, if such fumigation is not practicable, all soil should be burned at once. A week after repotting, the plants are watered with a solution of potassium permanganate, to promote vigorous growth, using rather less than a level teaspoonful of the crystals to a gallon of rain-water.

The plants are inspected periodically, and if the collars, which are usually the first point of attack, show signs of infestation, the pots are left unwatered for a few days to render the soil thoroughly porous, and the collars are then ringed with P5 grade of paradichlorobenzene. After 5–6 hours, remaining crystals and old " wool " are removed. This treatment is renewed whenever necessary, followed by a thorough soaking with potassium permanganate solution. The plants are treated in a well-ventilated shed ; those fumigated under bell-jars were severely scorched by the paradichlorobenzene. If the roots are infested, paradichlorobenzene is scattered freely over the entire surface of the dry soil and left for three days or more. When the plants are bedded down for the winter, a small quantity of the fumigant is placed beneath each pot, or amongst the drainage material, the perforated zinc crocks allowing free percolation of the vapour. Of 70 pots so treated in 1935, 66 were entirely free from infestation in May 1936, and infestation in the remaining 4 was very slight. Of the 6 control pots, 3 were very heavily attacked and only 1 was uninfested. This treatment is also effective against other soil pests and the red spider mite [*Tetranychus telarius*, L.].

Fisher (R. C.). **Recent Research on Wood-destroying Insects.**—*J. R. Soc. Arts* **85** no. 4400 pp. 407–425, 1 fig., 1 map. London, 19th March 1937.

Recent investigations on the bionomics and control of *Lyctus* spp. and *Xestobium rufovillosum*, DeG., infesting dead wood and structural timber in Britain are reviewed, much of the information having already been noticed [*R.A.E.*, A **25** 51 ; **24** 550, etc.]. Quantities of timber infested with *Lyctus* are imported every year, but infestation subsequent to importation is frequent [*cf.* **20** 509]. Susceptibility of timber to attack by members of this genus depends not only on the size of the pores in the wood [**22** 545], but also on the amount of starch present [**24** 551]. Experiments are being carried out by F. Y. Henderson on the removal of starch from green timber by keeping the wood under optimum conditions of temperature and humidity for the katabolism of the living cell. The starch in 1-inch ash boards disappeared after 16 days' treatment at 41°C. [105·8°F.] and 100 per cent. relative humidity. Further work is in progress to confirm these results and to determine whether such treatment could be applied commercially.

Continued observations on the life-cycle of *X. rufovillosum* [**23** 156] showed that it lasted 5 years in moderately decayed oak sapwood and willow infested with the fungi, *Phellinus cryptarum* and *Fomes applanatus*, respectively, both lots of wood being kept out of doors and having a moisture content of about 18 per cent. In sound willow (14–20 per cent. moisture content) kept for 7 years at laboratory temperatures, and in sapwood and heartwood of oak (with moisture contents of 19 and 16 per cent.), kept for 4½ and 5½ years, respectively, at 20°C. [68°F.], development was much delayed, the larvae at the end of these periods being still small or only half-grown. Studies on the distribution of *Xestobium* showed that it was more abundant in the south than in the north of England. There is no authentic record of its occurrence in buildings in Scotland or Ireland, which may be due to lack of observation, to the absence of mediaeval buildings containing oak timbers, or to climatic conditions. Infestation is rare in well-ventilated parts of buildings, such as the belfries of churches, and it is probable that the provision of adequate ventilation in all parts of new buildings will render them much less liable to attack.

FAJANS (E.) & MARTIN (H.). **The Incorporation of Direct with Protective Insecticides and Fungicides. II. The Effects of Spray Supplements on the Retention and Tenacity of Protective Deposits.**—*J. Pomol.* **15** no. 1 pp. 1–24, 6 refs. London, April 1937.

The following is the authors' summary of this paper, which is the second of a series [*R.A.E.*, A **24** 225]: The physical properties of spray deposits affecting the efficiency of protective insecticides and fungicides are discussed. The quantity of spray residue is determined by the initial amount deposited upon the sprayed surface (initial retention) and the ability of the deposit to withstand the action of the various agencies tending to its removal (tenacity). In addition, qualities of the spray deposit such as the uniformity of deposition (coverage) are concerned in relation to their effect upon the action of solubilising agencies (availability) and upon tenacity. The initial retention of the solid particles of the suspensions examined is shown to be that of the aqueous phase [*cf. loc. cit.*], an indication that no preferential retention of the solid occurs. In the majority of the systems examined, the initial retention of the suspension is the same as that of the aqueous phase, but, in a number of cases, the presence of solid particles reduces initial retention. This phenomenon appears to be related to the effect of the solid particles on the wetting and spreading properties of the spray, but it is shown not to be independent of the nature of the surface sprayed. The tenacity of the spray deposit is dependent upon the characters of the spray supplement, of the solid particle and of the surface sprayed. As a general rule, the degree of tenacity is determined by the relative ease of wetting of the spray deposit and, in accordance with this hypothesis, (i) tenacity is comparatively higher upon surfaces wetted with difficulty, (ii) supplements yielding residues insoluble in cold water, *e.g.*, gelatine and lime casein, exert a favourable effect upon tenacity, whereas highly surface-active supplements, especially at high concentrations, exert a deleterious effect upon tenacity, (iii) oils, both hydrocarbon and glyceride, enhance tenacity. The laboratory method for the estimation of initial retention furnishes results in satisfactory agreement with field estimates based upon spray residue determinations. The laboratory estimates permit the arrangement of the spray supplements examined in order of favourable and unfavourable effect upon tenacity. This order is almost identical with that deduced from field trials.

Kearns (H. G. H.), Martin (H.) & Wilkins (A.). **Investigations on Egg-killing Washes. II. The ovicidal Properties of Hydrocarbon Oils on** ***Aphis pomi*** **De Geer.**—*J. Pomol.* **15** no. 1 pp. 56–68, 10 refs. London, April 1937.

An account is given of investigations into the characteristics of hydrocarbon oils suitable for the control of eggs of Aphids and Psyllids, which are not affected by petroleum oils of the usual types. A method is described by which oils were tested against the eggs of *Aphis pomi*, DeG., in the laboratory. The experiments showed that the ovicidal properties of tar oils increased with their boiling range. There was a high correlation between the ovicidal properties of the washes and their content of neutral oils soluble in dimethyl sulphate, when the oils had a sufficiently high boiling range ; there was no correlation between ovicidal efficiency and the total concentration of hydrocarbon oils employed. From this evidence and that from the literature, it is suggested that the division of hydrocarbon oils into tar oils and petroleum oils is insufficient to differentiate oils suitable and unsuitable for use as ovicides for Aphids, and that the best alternative would be the adoption of definitions based on the actual analytical process, even though this introduces the cumbersome expression " neutral oils soluble (or insoluble) in dimethyl sulphate." Investigations were then made into the ovicidal constituents of neutral oils soluble in dimethyl sulphate. Neutral oils treated with hydroferrichloric acid, which removes certain of the oxygenated derivatives as a sludge, did not differ significantly in efficiency from untreated oils, so that the ovicidal constituents had not been separated by the treatment. Individual compounds present in the high-boiling tar oils (only a few of which are known), and in low-boiling tar oils, and a few miscellaneous substances, were then tested for ovicidal properties at low concentrations, as they would probably occur in the oils, but none of them was markedly toxic at the concentrations employed, nor did their toxicities differ much.

Warburton (C.). **Annual Report for 1936 of the Zoologist.**—*J. R. agric. Soc. Engl.* **97** pp. 485–492, 2 figs., 1 ref. London, 1936. [Recd. May 1937.]

Most of the insect pests recorded in England and Wales in 1936 were species of common occurrence, and there were few extensive outbreaks. Cutworms caused considerable damage to mangels and beet [*cf. R.A.E.*, A **25** 462] ; the species concerned in some cases was *Plusia gamma*, L. Reference is made to the discovery of *Platyparea poeciloptera*, Schr., on asparagus in 1935 and notes from the literature are given on its bionomics and control [*cf.* **25** 284].

Miles (M.). **The Apple Pith Moth.**—*J. Minist. Agric.* **44** no. 2 pp. 138–142, 3 pls., 6 refs. London, May 1937.

A less detailed account than one already noticed [*R.A.E.*, A **19** 135] is given of the bionomics of *Chrysoclista atra*, Haw., on apple in England and possible measures for its control, and reference is made to a recent paper establishing its identity [**21** 427]. In 1936, it caused more serious damage than usual in Lincolnshire, Cambridgeshire, Kent and Hertfordshire.

The Narcissus Pests (Lincolnshire (Holland)) Order of 1937.—*S.R.O.* 1937 no. 237, 3 pp. London, 19th March 1937.

This Order, which came into operation on 1st April 1937, and applies to part of southern Lincolnshire, empowers officers appointed by Local Authorities to examine any narcissus plants or bulbs on any premises and to require the occupier to treat them in any prescribed manner if they are infested with *Merodon equestris*, F., *Eumerus strigatus*, Fall., *E. tuberculatus*, Rond., *Tarsonemus approximatus* var. *narcissi*, Ewing, or the Nematode, *Anguillulina dipsaci*, Kühn.

Wilson (G. F.). **A Leaf-hopper (Jassid) on Rhododendron.**—*J. R. hort. Soc.* **62** pt. 5 pp. 210–213, 2 pls., 8 refs. London, May 1937.

The Jassid, *Graphocephala coccinea*, Forster, is widely distributed in the eastern half of the United States and Canada, occurring on numerous food-plants, records of which are reviewed from the literature. It was found, for the first time in England, on *Rhododendron* in Surrey in 1933 and has since become established in several localities in that county. It has apparently been confined to *Rhododendron*, except that a few adults were found in one instance on *Kalmia*. Even when numerous it did not cause damage, except in one garden where leaves of *R. discolor* were extensively spotted, the feeding lesions having become infected with a bacterial organism. It is thought that if remedial measures should become necessary, a nicotine dust would probably be more effective than a spray.

A short description of the adult is given.

Rigalleau (L.). **Les éphippigères et l'agriculture.**—*Rev. Zool. agric.* **35** no. 12 pp. 177–182, 19 refs. Bordeaux, December 1936.

Severe outbreaks in Médoc of *Ephippiger ephippiger*, Fieb., on vines, to which it usually migrates in late July or early August, are attributed to the sandy nature of the soil, which facilitates oviposition, and the presence of lucerne fields adjoining the vineyards, of vines remaining in fallow land and of bramble bushes [*cf. R.A.E.*, A **19** 156; **22** 715]. Pairing occurs more than once during the season, and nearly 4,000 eggs were recovered at the end of September from cages in which 60–70 females and about 100 males had been kept. In a vineyard visited on 23rd August 1936, *Ephippiger* had infested the outside 3 or 4 rows of vines to such an extent that the loss of a third of the crop was anticipated, in spite of hand-collection. The leaves of the vines were being devoured by swarms of *Calliptamus* (*Caloptenus*) *italicus*, L., some of which, however, had been killed by *Empusa grylli*. On a neighbouring plot where no control measures had been used, the vines were completely stripped by the two species. *Ephippiger* is attacked by *Sphex occitanicus*, Lep., and various birds, but they are of little value in reducing its numbers. Supplementary control measures include hand-collection of the hoppers in lucerne adjoining the vineyards, and the clearing of fallow land and woods in winter, care being taken to remove brambles.

FEYTAUD (J.). **Comment le doryphore envahit l'Europe.**—*Rev. Zool. agric.* **35** nos. 2, 3, 5–9, 11–12 pp. 17–30, 37–44, 65–77, 81–91, 97–105, 125–128, 129–137, 161–173, 183–191, 10 figs., 1 fldg. map, many refs. Bordeaux, 1936.

The history of *Leptinotarsa decemlineata*, Say, in America, the measures taken to prevent its establishment in Europe, and early outbreaks there are reviewed, and details are given of its establishment in France. In 1935, its advance across France [*R.A.E.*, A **24** 410] was even more considerable than in 1934 [**23** 481], and large populations were built up in many Departments previously free or almost free from infestation. Of the Departments that were completely or almost completely infested at the end of 1935, 11 were already so in the previous year, and 23 had only occasional foci. Seine-et-Marne and Marne were not previously infested. Of the Departments that were partly infested, 16, most of which adjoin the English Channel or the north-east frontier, had not been previously infested. Reference is made to the discovery of infestation in Belgium [**23** 739, 740 ; **24** 86].

The climatic limits of the distribution of the beetle are discussed in relation to those of potato. They are largely the same, but the insect can support neither the sustained periods of frost likely to occur in some districts where potatoes are grown, if the ground is unprotected by snow, nor prolonged drought accompanied by heat, which is fatal to the immature stages and often to the adults, though sometimes these save themselves by rapidly entering the soil for a period of aestivation that may be prolonged into hibernation. The climate would permit the occurrence of *Leptinotarsa* over practically the whole of Europe and parts of north Africa.

The spread of infestation after the establishment of the first focus is attributed to flight [**20** 73], favoured by the ability of adults to survive for a considerable time without nourishment and by the rapid rate of reproduction. In a section on natural obstacles to distribution, it is pointed out that the adults can survive for a considerable time if forced to descend on water, and that a belt of water such as the English Channel will not stop their progress. Trees, hedges, walls and hills are likewise not a permanent barrier, as the beetles sooner or later make their way between or over them. Only chains of mountains afford protection, but these may be crossed on vehicles. The question of natural enemies is discussed, mainly from the literature, as well as various methods of control, including leaving food-plants in known foci of infestation to localise them.

NIETZKE (G.). **Der Erlen-Blattkäfer** (*Agelastica alni* **L.**). [The Alder Leaf Beetle.]—*Natur u. Volk* **67** no. 3 pp. 149–153, 8 figs. Frankfurt a. M., 1st March 1937.

Illustrations are given showing the injury done to the foliage of alder in Holstein by *Agelastica alni*, L., together with notes on the biology of this Galerucid [*cf. R.A.E.*, A **23** 392].

Steiner (P.). **Hausbockuntersuchungen. (1. Mitteilung.) Ueber den Einfluss von Temperatur und Feuchtigkeit auf das Eistadium und Bemerkungen zur Biologie der Imago.** [Investigations on *Hylotrupes bajulus.* (1st Communication.) On the Influence of Temperature and Humidity on the Egg Stage and Observations on the Biology of the Adult.]—*Z. angew. Ent.* **23** no. 4 pp. 531–546, 5 figs. Berlin, January 1937. [Recd. May 1937.]

During the past ten years, injury by *Hylotrupes bajulus*, L., to timber in buildings has increased, and costly measures have become necessary in many parts of Germany, over a million marks being expended in 1935 in the Hamburg district. Conditions are favourable for infestation in areas in a temperate region with a moist coastal climate, such as Schleswig-Holstein, Denmark, Finland and Estonia, and, locally, in buildings where there is much atmospheric moisture and a suitable temperature.

A description is given of the technique employed in tests of the effects of temperature and humidity on the eggs. The upper temperature limit for incubation was 38·7°C. [101·66°F.], at which all eggs were killed irrespective of the humidity. The shortest incubation period was 5·9 days at 31·5°C. [88·7°F.] and 90–95 per cent. humidity, and the longest 48 days at 16·6°C. [61·88°F.] and 18 per cent. An increase of humidity distinctly accelerated development. The development zero was at about 13·6°C. [56·48°F.] with 90–95 per cent. humidity, and at 12·5°C. [54·5°F.] with 18 per cent.

At 100 per cent. humidity, many of the eggs (sometimes over 50 per cent.) were killed by moulds. High temperatures (31·5°C. and 26·3°C. [79·34°F.]) reduced this mortality by accelerating the development of the eggs and retarding the growth of the fungi, which was vigorous at medium temperatures (22·8°C. [73·04°F.] and 16·6°C.). The most favourable humidity was 90–95 per cent., at which the percentage mortality was 0–3·2 at 22·8–31·5°C. and not more than 13·1 per cent. at 16·6–19·3°C. [66·74°F.]. Humidities of 70–80 or 50–60 per cent. were also generally favourable, but 28–36 per cent. was less so, and mortality was high at 18 per cent. Humidity also influenced the size of the first-instar larvae, the largest and most vigorous ones occurring at 100 or 90–95 per cent.

The average total number of eggs laid by females of *H. bajulus* in the laboratory was 105·2. Females oviposited 1–7 times, usually 1–3. Those that oviposited once only, however, had probably already laid eggs before they were caught. The usual period between successive ovipositions was 2–3 days, and the maximum 10. Observations indicated that adult males probably live for an average of about 11 days and females for 13 or 14.

Schuch (K.). **Beiträge zur Ernährungsphysiologie der Larve des Hausbockkäfers** (*Hylotrupes bajulus* **L.**). [Contributions to the Physiology of Nutrition of the Larva of *H. bajulus.*]—*Z. angew. Ent.* **23** no. 4 pp. 547–558, 5 figs., 2 refs. Berlin, January 1937. [Recd. May 1937.]

Experiments were made at Kiel to ascertain the nutritional value for larvae of *Hylotrupes bajulus*, L., of heartwood and sapwood of pine, which is the timber chiefly used for building in Schleswig-Holstein. Old larvae were used. The methods employed are described and the results are tabulated. In tests lasting 135 days, 10 out of 11 larvae in sapwood increased in weight, the increase varying from 29·6 to 84·6 per cent. Only 3 out of 21 larvae in heartwood increased in weight, the greatest increase being 15·7 per cent. One larva retained its original weight, 9 showed a decrease, and 8 died. Infestation must therefore decrease once the sapwood has been destroyed.

In attics, the larvae live in air-dried timber, and moisture has been disregarded as a factor affecting them. Such wood, however, contains a considerable quantity of water, the amount fluctuating with the varying environmental moisture and temperature. Experiments in this connection were made, and the data are tabulated. In 130 days at an average room-temperature of 20·8°C. [69·44°F.] there was an average increase in larval weight of 13·1 per cent. in wood containing 7·5 per cent. moisture and one of 120·3 per cent. in wood containing 23·9 per cent. moisture. Increased moisture in the wood accelerated the growth of the larvae and their destructiveness. The total weight of frass averaged 504·7 mg. with 7·5 per cent. moisture and 1958·4 mg. with 23·9 per cent.

HOPPE (E.). **Untersuchungen über die Vitalität zweier Stämme von** *Habrobracon juglandis* **Ashmead unter verschiedenen Bedingungen.** [Investigations on the Vitality of two Strains of *Microbracon hebetor*, Say, under different Conditions.]—*Z. angew. Ent.* **23** no. 4 pp. 559–577, 7 figs., 7 refs. Berlin, January 1937. [Recd. May 1937.]

A detailed account is given of experiments in Germany with two strains of *Microbracon hebetor*, Say (*Habrobracon juglandis*, Ashm.) parasitising larvae of the meal moth [*Ephestia kuehniella*, Zell.]. One strain (W) had been habituated to a temperature of 30°C. [86°F.], and the other (K) to one of 23°C. [73·4°F.]. Each was normally reared at the temperature to which it had been habituated. The following is taken partly from the summary : The females of strain W produced the most progeny during the second quarter of their lives. When kept at 23°C., they lived longer, but laid fewer eggs, and the mortality of the developmental stages was greater. Females of strain K produced most progeny in the first quarter of their lives. When kept at 30°C., they lived for a shorter time and laid fewer eggs, and the mortality of the developmental stages was greater. When kept at 30°C. for several generations this strain died out.

Food also influenced longevity. Honey, maltose and other sugars were tested with both sexes, and the males were also offered, but refused, body juices of larvae of *Ephestia*. Males of strain W lived for an average of 4·9 days without food, 13 days with maltose and 17·17 with honey at 30°C. ; at 23° the periods were prolonged to 8·1, 14·2 and 18·5 days. The corresponding periods for males of strain K were 11·3, 12·1, and 20·1 days at 23°C., and 5·5, 10·1 and 13·3 days at 30°. Very similar results were obtained with the females.

Both strains lived longer at a relative humidity of 50–60 per cent. than in dry or saturated air. The presence or absence of daylight had no effect on their longevity.

Auel (H.). **Einfluss der Witterungselemente auf die Grösse von *Pieris brassicae* L. (Lep.).** [The Influence of Weather on the Size of *P. brassicae*.]—*Z. angew. Ent.* **23** no. 4 pp. 596–602, 1 graph, 3 refs. Berlin, January 1937. [Recd. May 1937.]

Measurements of the length of the forewings of *Pieris brassicae*, L., obtained in Germany in various years between 1903 and 1934 are given, together with meteorological data for these years. The greatest wing lengths corresponded to moderate climatic conditions. It was also noticed that the distance between the wing bases was narrowest in a very dry year.

Thalenhorst (W.). **Versuche über die Wirkung von Kontaktstäubemitteln auf *Pieris brassicae* L. unter besonderer Berücksichtigung der Abhängigkeit von biotischen und abiotischen Faktoren. (Zugleich ein Versuch zur Ausgestaltung der Prüfungsmethodik.)** [Experiments on the Effect of Contact Dust Insecticides on *P. brassicae* with special Regard to Dependence on biotic and abiotic Factors. (Also an Attempt to develop the Technique of Testing.)] —*Z. angew. Ent.* **23** no. 4 pp. 615–652, 35 figs., 21 refs. Berlin, January 1937. [Recd. May 1937.]

An account is given of laboratory and field tests in 1933–34 in Germany to ascertain the value of contact dust insecticides against *Pieris brassicae*, L. It is pointed out that, in practice, insecticides are not applied until injury is apparent, by which time the larvae are in the fourth instar and comparatively resistant, and that as the cabbages and other cruciferous crops attacked are of small market value, the costs of control must be low. Most of the laboratory tests were made on larvae reared from eggs collected in June and August near Kiel. To ensure accurate application of the dusts, a simplified form of the Görnitz apparatus [*R.A.E.*, A **21** 385], with no cupboard, was used. The balance was placed beside a shallow dusting-box into which could be introduced, through a slit in its side, a rod connected to one scale-pan and supporting a piece of thick paper 150 sq. cm. in area. The box was covered by a glass bell and could be shut off from it by a sliding lid. The larvae to be dusted were placed in two dishes in the box with the lid closed, dust was blown into the bell through a glass tube in the lid, which was then opened, and when the balance showed that sufficient dust had settled on the paper, and hence on the exposed larvae, the lid was closed, and the larvae were transferred to fresh cabbage leaves.

Breeding at temperatures from 11° to 28°C. [51·8° to 82·4°F.] and heavy rainfall had no definite effect on the susceptibility of the larvae to the dusts. It was not sufficient for comparison, however, to use larvae of a given instar; they also had to be of the same size. They were dusted when half-way through the fourth instar, as the requisite amount of poison, averaging 0·4 mg. per sq. cm., was then sufficiently large to permit of accurate measurement. A list is given of the proprietary preparations of derris, pyrethrum, nicotine and unknown composition that were tested, and the results of laboratory and field investigations on them are illustrated in graphs. After dusting, the rate of larval mortality rose as temperature and humidity increased. It is concluded that dusts are suitable for work on a large scale against *P. brassicae*, but that, of those tested, only preparations of derris are sufficiently reliable, and that dusting is best carried out early on a calm day promising warm weather or prolonged rain or both after dusting.

ANTONGIOVANNI (E.). **Un nuovo parassita del** *Chrysomphalus dictyospermi* **Morg.** [A new Parasite of *C. dictyospermi*.]—*Boll. Soc. ent. ital.* **69** no. 3 pp. 44–46, 2 figs. Genoa, 24th April 1937.

An Encyrtid, possibly *Habrolepis pascuorum*, Mercet, is recorded as parasitising *Chrysomphalus dictyospermi*, Morg., on lemon in Sicily. It is probable that its normal host is some little-known Coccid and that it has adapted itself to *C. dictyospermi*, a parallel case being the adaptation of *H. rouxi*, Comp., to *Aonidiella aurantii*, Mask., in the Transvaal [*R.A.E.*, A **25** 77].

[KOZHANCHIKOV (I. V.).] **Кожанчиков (И. В.). The Problem of the vital thermal Optimum. III. The Loss of Energy during pupal Development in** *Agrotis* **and** *Ephestia* **as a Function of Temperature.** [*In Russian.*]—*Trav. Inst. zool. Acad. Sci. URSS* **4** no. 2 pp. 313–388, 4 figs., 4 pp. refs. Leningrad, 1936. (With a Summary in English.)

A detailed account is given of experiments in Leningrad on the influence of temperature and humidity on the pupae of *Euxoa* (*Agrotis*) *segetum*, Schiff., and *Ephestia kuehniella*, Zell., and on the resultant adults. The maximum rate of pupal development did not occur at the highest temperature ; thus pupal development of *Ephestia* was completed in 7·5 days at 30·4°C. [86·72°F.] and a relative humidity of 50 per cent., but required 9·2 days at 34·4°C. [93·92°F.] and 75 per cent. humidity, while that of *Euxoa* was completed in 10·4 days at 30·3°C. [86·54°F.] and 70 per cent. humidity, and occupied 11 days at 34·5°C. [94·1°F.] and 80 per cent. Under other conditions of humidity, the pupal stage lasted longer, and development was quicker at higher temperatures. The thermal limits of development of the pupae of both species were almost equal, ranging from 10 to about 35°C. [50–95°F.]. Minimum mortality of *Ephestia* occurred at 21·4–26·2°C. [70·51–79·16°F.] and 40–60 per cent. humidity, and that of *Euxoa* at 21·1–25·5°C. [68·98–77·9°F.] and a humidity ranging from 55 to 100 per cent.

Adults of both species from pupae that had developed at extremes of temperature and humidity were anatomically and morphologically abnormal. Humidity during pupal development greatly affected egg-production by the resulting females. The average numbers of eggs laid (204) and remaining in the ovaries at death were both highest in *Ephestia* when the pupae had been kept at 23–25°C. [73·4–77°F.] and 60 per cent. humidity. The number laid by *Euxoa* was highest (841) when the conditions were 19–20°C. [66·2–68°F.] and 75 per cent. humidity, and very small numbers remained in the ovaries. Different combinations of temperature and humidity during pupal development did not influence the length of adult life of *Ephestia*, which usually lasts for only 6–10 days. Adults of *Euxoa* lived longest (30–40 days) when the pupae had been kept at 19–21°C. [66·2–69·8°F.] and 75–95 per cent. humidity, any deviation from these conditions reduced longevity, and at the extremes the moths lived only a few hours. In the case of both species, the number of eggs deposited did not, however, depend on longevity, which indicates that oviposition is dependent on the maturation of the gonads in the pupal stage, and that the feeding and long life of the resultant adults cannot replace the processes that should occur then. The minimum percentage of sterile moths was found when pupal mortality was lowest and the egg-production was highest.

The intensity of metabolism during pupal development was affected by both humidity and temperature [*cf. R.A.E.*, A **22** 663]; the energy expended at low humidity was three to four times as great as that expended at medium humidity. An increase in gaseous exchange as the temperature dropped occurred in both species, but was more marked in *Ephestia*. Pupal mortality under unfavourable conditions of temperature and humidity, and the decrease in the egg production of the females from surviving pupae are the result of this increased expenditure of energy, which explains why the optimum conditions for survival and subsequent egg-production are not those at which pupal development is most rapid. They are characterised by a considerably lower temperature, and high temperature combined with low humidity is particularly injurious.

[KOZHANCHIKOV (I. V.).] **Кожанчиков (И. В.). On the Periodicity of Mass Propagation of Insect Pests. First Report. The Influence of Temperature and Humidity on the pupal Development of** *Agrotis segetum* **Schiff. and on the Quantity of the next Generation.** [*In Russian.*]—*Bull. Plant Prot.* (1) no. 19, 36 pp., 1 map, 62 refs. Leningrad, 1936. Price 2 *rub.*

Much of the information in this paper on the pupal development of *Euxoa* (*Agrotis*) *segetum*, Schiff., is identical with that already noticed [see preceding abstract]. It was found that the optimum conditions for pupal development occurred at 17–25°C. [62·6–77°F.] and a humidity of 65–85 per cent., at which mortality was lowest (0–10 per cent.), the expenditure of energy in the process of development was smallest, the resulting moths lived long, sometimes for more than a month, and laid many eggs, with a maximum of more than 1,000 per female, and practically no sterility was observed.

Investigations showed that the overwintered larvae pupate at different times in different parts of the Russian Union. In the northern part of European Russia (Vologda, Novgorod, etc.), pupae occur from mid-May to the middle or end of June. In northern Ukraine and Voronezh, where there are two generations a year, the larvae of the overwintered generation pupate in the second half of April or in May, and those of the summer generation about the beginning of July. In North Caucasus and Daghestan, where three generations are produced, the overwintered larvae pupate about the end of April, and those of the spring generation at the end of June. There is only one generation in southern Siberia, but three occur in Turkmenistan and Uzbekistan. The duration of the pupal stage varies from 12 to 30 days. In European Russia, the area in which the moth is constantly a pest and outbreaks periodically occur is characterised by about 50 mm. [2 ins.] rainfall in May [*cf. R.A.E.*, A **25** 394]. No outbreaks take place to the west of this area, where more humid conditions prevail, or in the drier regions in the east and south, where the amount of rainfall in May does not exceed 20–30 mm. The abundance of the moth is dependent on the weather in May because of its effect on the pupal stage. In the southern part of the area in which it is injurious (Kharkov, Voronezh, etc.), abundant rainfall in July favours the development of the pupae of the summer generation, but outbreaks occur only if the weather in the preceding spring was also damp and thus favoured the pupae of the overwintered generation. Maximum oviposition is induced by moderate humidity during pupal development if the temperature is under 20°C. [68°F.] ; if, however, the temperature is higher, 85–100 per cent. humidity is favourable. This explains why, in the south of European Russia, where the average temperature at the time of pupal development is above 20°C., outbreaks could only take place in years with a very damp spring and a cool and damp July, a combination that hardly ever occurs.

[SAVCHENKO (E. N.) & LEVKOVTZEVA (V. N.).] **Савченко (Е. Н.) и Левковцева (В. Н.). Use of Molasses and Pectin Glue for increasing the Effect of intestinal Insecticides in Beet Spraying.** [*In Russian.*]—*Nauch. Zap. sakharn. Prom.* **13** no. 3 pp. 76–89, 4 figs., 29 refs. Kiev, 1936.

An account is given of experiments in the Ukraine in which the addition of molasses or pectin glue increased the effectiveness of sprays of barium fluoride, sodium fluoride and Paris green against *Cleonus* (*Bothynoderes*) *punctiventris*, Germ., *Cassida nebulosa*, L., and larvae of *Loxostege sticticalis*, L., on beet. Lime was added to all sprays containing Paris green. The percentage mortalities of *Cleonus* obtained in the laboratory by sprays of sodium fluoride (1 per cent.), barium chloride (5 per cent.), or Paris green (0·4 per cent.) were 55·3, 40 and 41. The corresponding figures were 74·3, 70 and 59·6 when molasses (0·5–1 per cent.) was added to the sprays, and 74·5, 69 and 76·3 when pectin glue was added at the rate of 2 per cent. with the Paris green and 1 per cent. with the other insecticides. Barium chloride (5 per cent.) alone, with 0·5 per cent. molasses and with 1 per cent. pectin glue gave 10, 70 and 70 per cent. mortality of fourth-instar larvae of *Loxostege*. These results were fully confirmed in field tests against all three pests on beet. All the insecticides were rendered more effective by either molasses or pectin glue, but this was especially evident in the case of Paris green. The best control was invariably given by sodium fluoride ; barium chloride, owing to high humidity, was ineffective against *Loxostege* and only gave a low rate of mortality of *Cassida nebulosa*.

It was found that molasses and pectin glue reduce the surface tension and increase the viscosity of sprays of sodium fluoride and barium chloride. Molasses rendered all sprays more alkaline, whereas pectin glue rendered them more acid. In the case of Paris green, the latter increased hydrolysis and production of water-soluble arsenic, which, however, it adsorbed, so that scorching of the beet was not increased. Molasses is best used at the rate of 1 lb. to 10 gals. in all these sprays, and pectin glue at the same rate except with Paris green, for which the rate should be doubled. The mixtures with Paris green should be made in the form of a paste before dilution with milk of lime and water.

[IVANOV (S. P.), BORDONOS (T. G.) & LINDENBERG (V. A.).] **Иванов (С. П.), Бордонос (Т. Г.) и Линденберг (В. А.). Expansion of the principal Beet Insect Pests in the chief Beet-sowing Area (Ukraine, Kursk and Voronezh Regions).** [*In Russian.*]—*Nauch. Zap. sakharn. Prom.* **13** pp. 90–99, 3 maps, 3 refs. Kiev, 1936.

Details are given of the local distribution and abundance in the Ukraine and the Provinces of Kursk and Voronezh up to the year 1934 of a number of insect pests of sugar-beet, of which only the popular names are given. The most important are *Cleonus punctiventris*, Germ., *Loxostege sticticalis*, L., *Euxoa segetum*, Schiff., and *Chaetocnema* spp.

[KAZANSKIĬ (A. N.).] **Казанский (А. Н.). The Importance of** *Rhynchites bacchus* **L. in spreading Brown Rot of Fruit.** [*In Russian.*]—*Bull. Plant Prot.* (1) no. 10, 171 pp., 11 figs., 11 graphs, 19 refs. Leningrad, 1935. (With a Summary in English.) [Recd. 1937.] Price 6 *rub.* ; binding 1 *rub.*

This monograph comprises a detailed account of work carried out in the southern Crimea in 1927–28 on the relation between insect pests and the fungus, *Monilia*, causing brown rot of apricots, plums and apples. The pests studied included *Cydia* (*Laspeyresia*) *funebrana*, Treit., and *Hoplocampa flava*, L., on plum and *H. testudinea*, Klug, on apple, but chief attention was devoted to the weevil, *Rhynchites bacchus*, L., since it is known to be the principal insect concerned in the dissemination of *Monilia* [*cf. R.A.E.*, A **17** 429].

In the Crimea, some of the weevils complete their life-cycle in one year and others in two ; in the latter case the larvae remain in the soil from one autumn to the next before pupating. Irrespective of the length of the larval stage, the adults emerge in autumn and hibernate under the bark of the trees or under débris on the ground. Oviposition occurs during the whole of May, June and July, and sometimes in August. On an average, a female lays 200–300 eggs in 9 weeks. The process of preparing the egg-chamber in the fruit [*loc. cit.*] and of ovipositing is described in detail. Apricots and plums are attacked first, and apples later. A single egg is usually laid in a small fruit and several in a large one. Early in the season, when the fruits are still very young, the females make injuries on the surface and on the stalk ; this causes the fruit to dry up and prevents the growth of the tissues from injuring the eggs. Later in the season, when the fruits have ceased to develop, the weevils do not injure the stems, and puncture the surface of the fruits only to feed. During the whole of their active life, both sexes feed extensively on the flesh of the fruits ; the severe damage done by them is discussed in detail.

Fruits containing eggs of the weevil are invariably attacked by *Monilia*, so that the young larvae, which hatch in 8–10 days, live in a medium infested by it, feeding on the dead tissues of the fruit. The spread of the fungus is favoured by the habits of the weevil, its constant contact with the fruit and the protracted period of oviposition. The spores have been found in the intestinal tract of the adults and are introduced into the fruit by both sexes in the process of feeding, or by the female in the excreta used to seal up the egg-chamber. Moreover, the lesions made on the fruits render them very susceptible to natural infection by the disease. The author considers the relations of the weevil and fungus to be symbiotic, since the larvae are adapted to feeding in infested media.

Though *Cydia funebrana* is responsible for 50 per cent. of the infestation of plums with *Monilia* in the Crimea, the adults are not concerned in its spread and the larvae cannot develop in fruits infested by it. This Tortricid was found to have one complete generation a year and a partial second in the Crimea, the adults being on the wing in May–June and again in August in 1928. The second-generation larvae do not occur on cultivated plums, but on closely allied wild species of *Prunus*. Plums were attacked from the beginning of June and were severely infested by *Monilia* at the end of that month. Eggs are laid on the surface of the plums without any injury to the fruit. The larvae burrow under the skin and gradually make their way deeper ; eventually they mine on the surface of the stone, but do not injure it. The spores of *Monilia* penetrate into the fruit soon after the larvae have burrowed into it, and gradually drive them out ; they then migrate to adjoining healthy fruits and carry the fungus with them. Injury by the larvae of *C. funebrana* is most often followed by infestation by the fungus in localities with a damp climate or in years of heavy rainfall.

The infestation of plums by *H. flava* or apples by *H. testudinea* appeared to render the fruits practically immune from attack by *Monilia*. In the case of plums, this was confirmed by experiments in which only 8 per cent. of fruits attacked by *H. flava* could be artificially infested with *Monilia* and the fungus developed in them much more slowly than in artificially infested sound plums. Larvae of *Hoplocampa* require living tissue for food and die in fruits infested by *Monilia*, but the way in which they render them resistant to the attacks of the fungus is unknown. Notes are given on the bionomics of these two sawflies [*cf. R.A.E.*, A **20** 579 ; **21** 560].

It is concluded that control of *Monilia* can be obtained by the control of *Rhynchites bacchus*, and not in any other way. The collection of fallen fruit to destroy both the weevil and the fungus is of great importance ; from mid-May to mid-June, when the weevil is most injurious, it should be carried out at intervals of 5 days, the trees being lightly jarred to bring down the fruits with injured stems. Jarring the weevils from the trees [*cf.* **21** 634] is also of great value before and after the flowering of stone fruits, to prevent them from migrating to apples. Attention should be devoted to the possibility of using insecticides against the adult weevils early in the season and soil fumigants against the larvae, pupae and young adults in August.

UVAROV (B. P.) & MILNTHORPE (W.). **The Locust Outbreak in Africa and western Asia in 1935.**—*Econ. adv. Coun. Comm. Locust Contr.*, 63 pp., 9 maps. London, H.M.S.O., 63–80–5, 1937. Price 3*s.*

In continuation of the similar survey for 1934 [*R.A.E.*, A **23** 637], the breeding and migrations in 1935 of *Schistocerca gregaria*, Forsk., *Locusta migratoria migratorioides*, R. & F., and *Nomadacris septemfasciata*, Serv., are discussed in detail and illustrated by a series of maps.

The interior of the Anglo-Egyptian Sudan continued to be free of *S. gregaria*, and North Africa had no spring invasion for the first time since 1926, although some breeding swarms were present south of the Sahara. There were some indications of the breeding up of swarms on the Red Sea coasts of the Sudan and Arabia, and a swarm that may have originated on the Red Sea appeared in Darfur in May 1936. This may herald the commencement of a new outbreak of this species, and there is need for very strict supervision of the known outbreak centres. The incipient swarming of *Schistocerca* that occurred in 1934 in the Union of South Africa died down in 1935, and a tendency to resume swarming in India in 1935 was checked by unfavourable weather.

The situation with regard to *Locusta migratoria migratorioides* continued to improve, and the eastern and south-eastern parts of Africa were clear of this species, while in Northern Rhodesia, the Belgian Congo and the Anglo-Egyptian Sudan, the 16th generation from the beginning of the outbreak bred on a reduced scale. The situation was less satisfactory in West Africa north of the equator, where a considerable hopper infestation and fairly numerous swarms were reported in both the British and French territories. Breeding was concentrated in the Middle Niger area, where the known outbreak centres are situated, a fact that provides further evidence that this is the only dangerous spot in the whole continent with regard to this species. Some incipient swarming of a subspecies of *Locusta migratoria* was observed in several parts of Palestine, but no definite swarms were formed and further developments are not anticipated. Since locusts in Palestine never reached the full gregarious phase, exact determination of the subspecies found there is not yet possible.

The hoppers of the 9th generation of *Nomadacris septemfasciata*, developing in the winter of 1934–35, were sufficiently numerous to cause serious anxiety in Africa south of the equator, but owing to a heavy infestation of all stages by the fungus, *Empusa grylli*, the swarms of this generation, which reached the mature stage towards the end of 1935, were much less numerous than those of the preceding one. Although the area infested by *Nomadacris* is gradually decreasing, the rate of decline of the outbreak is slow, owing to the formation of several very persistent breeding areas. Some swarms from Kenya penetrated into Italian and British Somaliland, but did not breed. Incipient swarming of *Nomadacris* was observed in Madagascar [*cf.* **24** 236].

An appendix contains a bibliography of papers dealing with the locust and grasshopper problem, continuing and supplementing those published in the previous surveys.

HARRIS (W. V.). **Helopeltis Bug.**—*E. Afr. agric. J.* **2** no. 5 pp. 387–390, 4 figs., 8 refs. Nairobi, March 1937.

The history of *Helopeltis bergrothi*, Reut., in Tanganyika, where it has recently become a serious pest of a variety of plants, is very briefly reviewed from the literature. The numerous food-plants include tea, cacao, cotton and cinchona. The injury to all is similar and results in spotting and crumpling of the leaves and the production of cankers on the stems and branches [*cf. R.A.E.*, A **24** 59, etc.]. It seriously impairs growth in nursery plants of avocado, guava, mango, etc., and renders difficult the propagation by cuttings of various ornamental plants. In 1936, a cotton field with an infestation averaging only 1·5 nymphs and adults per plant produced practically no crop. There are 5 nymphal instars, the egg, nymphal and pre-oviposition periods lasting, respectively, 11–16, 18 and 4–7 days. Pyrethrum and lime (1 : 2) applied with a dust-gun is recommended for control. A light dusting killed all adults on young avocado plants in the laboratory, and no adults were found 5 days after dusting a mixed nursery at the rate of 8 lb. pyrethrum per acre. As the dust cannot reach the eggs [**23** 99], a second application 16–19 days after the first is necessary.

Chu (Joo-tso) & Hsia (Shen-hsiu). **A List of the known Hymenopterous Parasites of the European Corn Borer** (*Pyrausta nubilalis* **Huebner**).—*Ent. & Phytopath.* **5** no. 8 pp. 136–147, 55 refs. Hangchow, 11th March 1937.

A list is given of over 70 species of Hymenopterous parasites recorded from *Pyrausta nubilalis*, Hb., showing their distribution and, in some cases, their other hosts and the parasites that attack them. It was compiled as a basis for an investigation of the possibility of the biological control of the moth in China, where it is a serious pest of maize, *Sorghum* and other plants.

Chen (Kia-ziang). **Preliminary Test on the Use of Tobacco Powder for controlling Rice Insects.** [*In Chinese.*]—*Ent. & Phytopath.* **5** no. 10 pp. 178–188. Hangchow, 1st April 1937. (With a Summary in English.)

In preliminary experiments on the use of waste tobacco dust against rice pests in China, it was found to kill *Nisia atrovenosa*, Leth., *Naranga aenescens*, Moore, and adults of *Chilo simplex*, Btlr., *Schoenobius incertellus*, Wlk., and other moths. The yield of rice is increased by using both the dust and stems of tobacco [*cf. R.A.E.*, A **25** 231], but the former is the more effective insecticide.

Franssen (C. J. H.). **Termietenbeschadiging aan electrische geleidingsdraden.** [Termite Injury to Electric Cables.]—*Ent. Meded. Ned.-Ind.* **3** no. 1 pp. 3–5, 1 fig. Buitenzorg, 1st March 1937.

Kalshoven (L. G. E.). **Nog enkele aanteekeningen over beschadiging van electrische geleidingsdraden.** [Further Notes on Injury to Electric Cables.]—*T.c.* pp. 5–6.

Franssen states that injury to the insulation of electric cables, sheathed in rubber with a cotton casing, plain or coated with paraffin wax, has been observed in various parts of the Netherlands Indies in recent years. It has been ascribed to *Dolichoderus bituberculatus*, Mayr, *Solenopsis geminata rufa*, Jerd., *Monomorium destructor*, Jerd., and *Monomorium* sp., but it appears unlikely that several different species of ants could all be concerned. In an experiment, the same type of injury was caused by a termite closely resembling *Coptotermes travians*, Hav., to pieces of electric cable buried in boxes in the ground ; and *S. geminata rufa* has been seen preying on termites that had left their galleries. On the other hand, one piece of damaged electric cable was received on which individuals of this ant had their mandibles fastened to the rubber.

Kalshoven points out that no excreta of *Coptotermes* have been found in the injured parts of any of the samples submitted, whereas this termite plasters its galleries with excreta, and that termites were not mentioned in any of the complaints.

DE FLUITER (H. J.). **Over den invloed van het voedsel op insecten.** [On the Influence of Foods on Insects.]—*Versl. 16e Vergad. Ver. Proefst. Person. Djember, Oct. 1936* pp. 153–170, 33 refs. Surabaya [1937].

The influence of amount and quality of food on the development of insects is discussed from the literature, and a brief account is given of experiments in Java with *Pseudococcus citri*, Risso, and *Ferrisiana virgata*, Ckll., on young coffee plants. *P. citri* showed a distinct preference for the shoots and young leaves still in growth ; all individuals on these parts of the plant developed into fully mature females, while on old leaves there were only a few mature females, male cocoons predominating. When *F. virgata* was reared on coffee plants in distilled water, almost all individuals at the end of the second generation were males ; on plants in a nutritional solution, most of the larvae, especially those on young leaves, developed into fully grown females. The fact that nutritional conditions can be made constant is valuable in studying the effect of other factors.

SOLOMON (M. E.). **Experiments on the Effects of Temperature and Humidity on the Survival of** *Halotydeus destructor* **(Tucker), Acarina fam. Penthaleidae.**—*Aust. J. exp. Biol. med. Sci.* **15** pt. 1 pp. 1–16, 9 figs., 16 refs. Adelaide, March 1937.

The following is substantially the author's summary of experiments carried out in Western Australia on the effects of different temperatures and atmospheric humidities on adults and, in some cases, nymphs of *Halotydeus destructor*, Tucker [*cf. R.A.E.*, A **23** 149], exposed with or without a food-plant (clover) : The survival period is defined as the period of exposure necessary to obtain 50 per cent. mortality with a group of about 50 mites in each experiment. At a given temperature, the survival period increases with the humidity ; the optimum humidity is near saturation. With atmospheres having the same saturation deficit but different temperatures, the survival period decreases with rise in temperature, except within the range 18–26°C. [64·4–78·8°F.], within which no difference in temperature effect was evident. The lowest temperature tested was 1°C. [33·8°F.]. Above 30–32°C. [86–89·6°F.], harmful effects of temperature occur and become the dominating factor influencing the survival rate ; the mites die within a few hours at 34°C. [93·2°F.] even when humidity is about the optimum, and in a fraction of minute at 50°C. [122°F.]. These results have an important bearing on the irregular fluctuations of *H. destructor* in the field.

MUESEBECK (C. F. W.). **Three new Brazilian Species of** *Heterospilus* **(Hym. Braconidae) Parasites of** *Gasterocercodes gossypii* **Pierce.**—*Rev. Ent.* **7** no. 1 pp. 8–11. Rio de Janeiro, 30th March 1937.

Descriptions are given of both sexes of *Heterospilus gossypii*, sp. n., and *H. hambletoni*, sp. n., and the female of *H. annulicornis*, sp. n., all reared from *Gasterocercodes gossypii*, Pierce, in São Paulo. This weevil is a serious pest of cotton in Brazil.

GAHAN (A. B.). **A new Brazilian Chalcidoid Parasite of** *Gasterocercodes gossypii* **Pierce (Hymenoptera).**—*Rev. Ent.* **7** no. 1 pp. 18–21. Rio de Janeiro, 30th March 1937.

Descriptions are given of the characters of the Pteromalid genus *Eurydinoteloides*, Girault, and also of both sexes of *E. longiventris*, sp. n., a primary external parasite of *Gasterocercodes gossypii*, Pierce, in São Paulo.

WILLE (J. E.). **El barreno de los brotes de la higuera en el Perú y su control.** [The Fig Shoot Borer in Peru and its Control.]—*Circ. Direcc. Agric. Ganad. Minist. Fom. Peru* no. 37, 9 pp., 8 pls. Lima, March 1937.

The Tineid, *Tortyra fulgens*, Feld., all stages of which are described, is a common pest of fig in the coastal districts of Peru. The adults, which live for 20–40 days, prefer fig to other plants and feed on dew and the sugary secretions on the leaves. The female deposits about 40 eggs singly, usually one on each shoot. The egg stage lasts 3–5 days, and the larva feeds in the first leaflet, spinning threads round it. In the second instar, or at the beginning of the third, it bores into the shoot, sometimes as far as three inches, causing the leaves to wither. Repeated attacks cause the branches to wither entirely and the tree dies. The larval and prepupal stages last 22–30 and 2–4 days, respectively, and the pupal stage, which is passed in the mine, lasts about two weeks in summer and up to two months in winter. It is shorter on well watered trees than on others, the abundant plant juices of the former apparently accelerating pupal development. Near Lima, there are usually 6 generations a year, or 7 if the winter is very warm.

Good control has been obtained by means of a lead arsenate spray applied frequently from the time that the first leaflets of the shoots unfold until most of the figs are formed.

TUCKER (R. W. E.). **A preliminary Investigation into Cane Varieties and Infestation by** *Diatraea saccharalis*.—*Agric. J. Barbados* **5** no. 4 pp. 121–142, 6 refs. Barbados, October 1936. [Recd. May 1937.]

An account is given of experiments in Barbados in 1934 on the susceptibility of different varieties of sugar-cane to attack by *Diatraea saccharalis*, F. In the six principal varieties tested, the percentage of internodes infested was in inverse proportion to the average number of cane shoots per stool, although the monthly average of egg clusters per 80 stools taken over a period of 8 months was nearly three times as high in the variety with the lowest percentage of infested internodes as the average for varieties with a much higher percentage of infested internodes. The variety on which the lowest total number of eggs was laid over a period of 8 months was, however, very severely damaged, and it is thought that the larvae may have a higher rate of survival in this variety, possibly owing to its being more easily penetrated by them [*cf. R.A.E.*, A **22** 326, 388 ; **23** 276]. The average numbers of eggs per cluster on the different varieties varied from 16·5 to 18·8, the difference not being statistically significant, although it may be of biological importance. There was a definite migration of young larvae to adjacent plots or stools of cane, as well as long distance migration on air currents.

EDWARDS (W. H.). **Insecticides to control Insect Pests in Jamaica.**—*Bull. Dep. Sci. Agric. Jamaica* N.S. no. 6, 50 pp., 4 pls., 10 figs. Jamaica, 1936. [Recd. May 1937.]

An account is given of the preparation and application of a number of sprays, dusts, baits and fumigants commonly employed against insect pests, with notes on their use against the various kinds of insects that attack coffee, tobacco, coconut, fruits and vegetables in Jamaica. In a final chapter are included dilution tables, and a table showing the amount of insecticide required per acre to apply 1 oz. or 1 fl. oz. per plant when the plants are different distances apart.

BALCH (R. E.). **The Spruce Sawfly Outbreak in 1936.**—*Pulp Pap. Mag. Canada* February 1937 repr. 6 pp., 8 figs., 1 map. Montreal, 1937.

The distribution of *Diprion polytomus*, Htg., in Canada and the United States in 1936 [*cf. R.A.E.*, A **24** 315] is shown on a map. North of the St. Lawrence, it extends for about 700 miles west from the Pentecost river in Quebec to the extreme east of Ontario. South of the St. Lawrence, the sawfly has been taken in practically all spruce forests from New Brunswick to New York State [*cf.* **25** 410], but it has not yet been found in the south of Nova Scotia. The large apparent increase in the infested area during the last two years includes some districts where the infestation was already old.

In the Gaspe peninsula, considerable mortality among the larvae was caused by delayed development at high altitudes owing to a late spring and cool summer in 1936, and by lack of food, as the spruce in the interior of the peninsula has been killed or almost completely defoliated. However, the number of cocoons in the ground remains high in relation to the amount of foliage, and destruction may be expected to continue. At lower elevations, injury to both white and black spruce [*Picea glauca* and *P. mariana*] increased, and the area of heavy infestation extended farther south ; many more cocoons overwintered in the ground. In the less heavily infested areas, the sawfly became more numerous in stands of immature white spruce. During 1936, the average numbers of sound cocoons taken in an area in Quebec west of the peninsula on 100 plots of 4 sq. ft. under white and black spruce were 83 and 63, respectively, in the spring and 86 and 178 in the autumn. The numbers of those from which adults had emerged and those destroyed by small mammals and by insects were, under white spruce, 28, 86 and 10, respectively, in the spring and 42, 108 and 70 in the autumn ; and under black spruce, 15, 34 and 5 in the spring and 32, 77 and 7 in the autumn. In the same locality, defoliation of old and new white spruce amounted to 88 and 25 per cent., respectively, in the spring, and 97 and 37 per cent. in the autumn ; defoliation of the old black spruce was 37 per cent. in the spring and 60 per cent. in the autumn, when 2 per cent. of the new black spruce was also stripped. A comparison of these figures with those for previous years showed that the percentage of cocoons from which adults emerge in a given year varies greatly, being sometimes as low as 2 ; that a reduction in damage for one or more years may precede more serious injury ; that the number of cocoons decreases beneath white spruce with the scarcity of needles for oviposition and feeding, but increases at the same time beneath black spruce ; and that small mammals are the only important natural control factor affecting the cocoons.

Throughout the greater part of the Gaspe peninsula, over half of the mature white spruce is already dead and the remainder in a weakened condition. The black spruce is in better condition, but on the slopes of the higher elevations it is very seriously defoliated and is dying. Mortality in young and immature stands along the coast is increasing. The total amount of dead and dying spruce in the peninsula has been estimated at 10,000,000 cords (about 47½ million cu. yds.), one fifth of the total population of spruce and balsam fir [*Abies balsamea*]. In most cases, if the spruce is not salvaged, the balsam fir will also be lost, either because it will not be profitable to cut alone or because it is damaged through exposure. Destruction by the sawfly may be expected to continue ; natural control factors remain inadequate and it is not attacked by native parasites. The establishment of imported parasites [*cf.* **25** 12] is therefore of extreme importance.

STRICKLAND (E. H.). **The northern Limits for Potato Beetle Infestation.**—*Sci. Agric.* **17** no. 7 pp. 447–450, 3 refs. Ottawa, March 1937.

Leptinotarsa decemlineata, Say, which is permanently established in the southern half of Alberta, where it was first observed in 1899, was recorded in small numbers in 1923, 1928 and 1935 in the portion of the northern part of the Province that has been settled, and in greater abundance in 1936. Potatoes are now grown as far north as the Arctic Ocean, and the chief factor preventing the permanent establishment of *Leptinotarsa* in northern Alberta appears to be the difficulty it has in surviving the winter. The northern limits of its range vary considerably from year to year and appear to depend on the humidity of the soil in late autumn and the temperature to which the adults are subjected during the winter. In Alberta, they appear to hibernate at an average depth of 18 ins. There is considerable variation in the cold-resistance of individual beetles in the laboratory [*R.A.E.*, A **22** 93], and it is probable that there is also considerable variation in the field, governed partly by the amount of moisture in the soil, which affects dehydration [**15** 457–458]. It appears to be the dryness of the soil that enables beetles to survive hibernation more easily in southern Alberta, though the soil temperature in the north is higher owing to the greater depth of snow. In the neighbourhood of Edmonton in northern Alberta, frost penetration was about 2 ft. for a number of years up to and including 1933–34, with the exception of 1927–28, when early falls of snow reduced the penetration to a few inches. In 1934–35, early snow again favoured *Leptinotarsa* by preventing the soil from freezing until February, when mild weather melted the snow. Cold in March froze the soil to a varying depth, in some places about 1 ft. In the autumn of 1935, the soil was dry, and heavy snow made conditions even more favourable than in the previous year.

Some years ago, 8 living adults were dug out of the ground in spring, 18 inches below the lower end of a gopher's burrow, 2 ft. deep. It is not known whether there is any significance in the fact that the permanent range of *Leptinotarsa* in Alberta corresponds to that in which gophers are most plentiful.

Larvae collected near Edmonton in July 1936 were kept in a box with potato leaves. When the box was opened in September, there were found in it 6 adult beetles, 1 pupa, 3 normal larvae and 22 larvae that contained Tachinid puparia, from which 16 adults of *Doryphorophaga doryphorae*, Riley, had emerged. This Tachinid has not been observed in other years, but the high rate of parasitism in the first year in which the larvae of *Leptinotarsa* were at all abundant suggests that it may have previously been breeding on some other host.

FOSTER (W. R.) & JEFFERY (C. E.). **Resistance of Winter Wheats to Hessian Fly.**—*Canad. J. Res.* (C) **15** no. 4 pp. 135–140, 4 refs. Ottawa, April 1937.

Experiments on the resistance of different varieties of winter wheat to infestation by the Hessian fly [*Mayetiola destructor*, Say] in British Columbia showed that varieties more advanced in growth at the time of spring emergence of the fly appeared to be more resistant than varieties less advanced. There was a positive correlation between infestation and the number of days to maturity, and a negative correlation between infestation and the height of the wheat on 1st April, about the time that flies begin to emerge and oviposit on winter wheat. Tables show the percentage infestation in the different varieties tested. Applications of sodium nitrate, superphosphate, and a complete fertiliser did not appear to have any significant effect on the yield of heavily infested wheat.

MCKENZIE (H. L.). **Morphological Differences distinguishing California Red Scale, Yellow Scale, and related Species (Homoptera-Diaspididae).**—*Univ. Calif. Publ. Ent.* **6** no. 13 pp. 323–335, 1 pl., 4 figs., 5 refs. Berkeley, Calif., February 1937.

The results are recorded of a study undertaken to determine whether morphological differences exist between the California red scale, *Aonidiella aurantii*, Mask., the yellow scale, *A. citrina*, Coq., and the closely related species occurring on various plants in other parts of the world [*cf. R.A.E.*, A **25** 77]. *A. citrina*, which when alive can be easily distinguished from *A. aurantii* by general appearance and habits, was originally described as a variety of it, but for many years it has been considered a distinct species [*cf.* **22** 134; **24** 574]. The studies showed that it was possible to distinguish morphologically between adults of *A. aurantii*, *A. citrina*, *A. taxus*, Leon., which was originally described from *Taxus* in Italy and has been taken on *Podocarpus* spp. in Japan and the Argentine, *A.* (*Aspidiotus*) *orientalis*, Newst., a common species in Asia that was described in the genus *Aspidiotus* but is considered to be a true *Aonidiella*, and of which *Aspidiotus cocotiphagus*, Marlatt, from Florida is a synonym, and *Aonidiella comperei*, sp. n. (false yellow scale), the female of which is described from *Citrus* in India. A key to these species is given; the last two differ from the others by the presence of perivulvar pores, which are in two groups in *A. comperei* and in five in *A. orientalis*. Parasite emergence holes, as well as an occasional parasite itself, are to be seen in what appears to be typical red scale (*A. aurantii*) from China, India and Africa [*cf.* **25** 77].

Weiss (H. B.) & Carruthers (R. H.). **Insect Enemies of Books.**—*Bull. N.Y. publ. Libr.* Sept.–Dec. 1936 repr. 63 pp., 4 pls. New York, 1937.

In the first part of this paper, by Weiss, notes are given on the appearance, bionomics and control of insects injurious to books in various parts of the world, of which the chief are cockroaches, various beetles that attack stored products, *Borkhausenia pseudospretella*, Stn., and allied Tineids, and termites. General methods of protecting books in the tropics are given from the literature. These are fumigation with carbon bisulphide at the rate of 1 lb. per 1,000 cu. ft. for 24–36 hours, the incorporation in the binding paste of a poison prepared by dissolving 5 gm. mercury bichloride and 60 drops wood creosote in 2 pints rectified spirits and adding 1 oz. carbolic acid, and varnishing the covers with gum shellac dissolved in rectified spirits, or with a solution recommended against termites but also effective against other pests, namely 1 oz. mercury bichloride, 1 oz. carbolic acid and 2 pts. methylated spirits with or without the addition of shellac. Regardless of geographical situation, fumigation in a vacuum with hydrocyanic acid gas, carbon bisulphide, paradichlorobenzene, naphthalene or a mixture of ethylene oxide and carbon dioxide is considered the best method of controlling most insects. For cockroaches, fumigation of entire rooms or the use of poison baits may be desirable.

The second part of the paper, by both authors, consists of a bibliography covering some 2,200 years, and arranged according to period, of nearly 500 works on, or containing references to, insect pests of books, with notes on the contents of each.

Marsh (F. L.). **Biology of the Ichneumonid** *Spilocryptus extrematis* **Cresson (Hymenoptera).**—*Ann. ent. Soc. Amer.* **30** no. 1 pp. 40–42, 1 ref. Columbus, Ohio, March 1937.

Notes are given on the bionomics of *Spilocryptus extrematis*, Cress., the principal parasite of *Samia cecropia*, L., in the Chicago area [*R.A.E.*, A **25** 415]. The first adults emerge in June when the larvae of the moth are about $\frac{9}{16}$ in. long, but only those starting to spin cocoons are selected for oviposition. Hosts are available from mid-July to the end of August. The female lays 18–48 eggs, and host cocoons contain an average of 33. Unfertilised eggs apparently always produce males. The larvae are ectoparasites and spin their cocoons in that of the host ; the first-generation adults emerge about 18 days after the eggs are deposited. Females are active for 14–16 days but males do not live so long. Half of a second generation is completed in summer in the Chicago area, but half of it overwinters as larvae, emerging from June to August of the following year, or even in June of the second year after oviposition.

Brannon (L. W.). **Life-history Studies of the Squash Beetle in Alabama.**—*Ann. ent. Soc. Amer.* **30** no. 1 pp. 43–50, 1 pl., 5 refs. Columbus, Ohio, March 1937.

An account is given of the life-history of *Epilachna borealis*, F., which attacks the leaves of nearly all cucurbits in Alabama, based on rearing experiments carried out during 1923–24, and all stages are briefly described. The adults emerge from hibernation in mid-April and start to feed 1–15 days later. The pre-oviposition period lasts about 7 weeks in spring and 2–3 weeks in the case of first-generation adults. Eggs are deposited in batches of 12–58 on the lower surface of the leaves, and the egg, larval and pupal stages last 6–8, 17–23, and 5–8 days, respectively. Development is completed in 30–38 days, being slowest in dry weather. The fourth-instar larva is the stage most injurious to crops. Two generations occur during the season; the adults of the second do not oviposit before hibernation. Males and females of the overwintering (second) generation lived 84 and 69 days, respectively, after hibernation, and those of the first generation lived 62 and 79 days. Under artificial conditions, the beetles preferred to hibernate in cracks of the bark of oak or pine, but in the field in Virginia, during the particularly severe winter of 1933–34, most of them were found on the ground along the borders of woods near the fields that had been infested in the previous year [*cf. R.A.E.*, A **12** 329]. A list is given of the food-plants of *E. borealis*.

FIFE (L. C.). **Number of Instars of the Pink Bollworm collected in Squares and in Bolls of Cotton.**—*Ann. ent. Soc. Amer.* **30** no. 1 pp. 57–63, 2 figs., 4 refs. Columbus, Ohio, March 1937.

Comparison of the frequency distributions of the head widths of 600 larvae of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., taken from the squares of cotton showed the presence of 4 instars. There was close agreement between the observed mean head widths of this series of larvae and of another of 230 taken from bolls, and the values obtained from geometrical progressions computed from the data, which indicates that the head widths of the instars fall in a geometrical progression as stated by Dyar [*cf. R.A.E.*, A **20** 579, etc.]. The growth ratio for the first series was 1·89 and for the other 2·04, but the mean head width of both groups was the same in the first instar.

WHITEHEAD (F. E.) & EASTEP (O.). **The Seasonal Cycle of** *Phylloxera notabilis* **Pergande (Phylloxeridae, Homoptera).**—*Ann. ent. Soc. Amer.* **30** no. 1 pp. 71–74, 1 fig., 3 refs. Columbus, Ohio, March 1937.

The seasonal cycle of *Phylloxera notabilis*, Perg., on pecan in Oklahoma is reviewed [*cf. R.A.E.*, A **23** 384]. Two, or possibly three, generations of gall-producing females hatching from eggs of alate females occur during the year. These have the same two types of offspring as do the stem mothers that hatch from the overwintered eggs [*loc. cit.*].

MAPLE (J. D.). **The Biology of** *Oöencyrtus johnsoni* **(Howard), and the Role of the Egg Shell in the Respiration of certain Encyrtid Larvae (Hymenoptera).**—*Ann. ent. Soc. Amer.* **30** no. 1 pp. 123–154, 9 figs., 25 refs. Columbus, Ohio, March 1937.

An account is given of experiments in California in rearing *Oöencyrtus johnsoni*, How., an endophagous parasite of the eggs of *Murgantia histrionica*, Hahn, that also occurs in Maryland, Virginia and Florida. It appears to be only occasionally of economic importance [*cf. R.A.E.*, A **21** 240], though it parasitised 64 per cent. of the eggs of the bug in one locality in California in September 1936. The technique of rearing is described. Oviposition began on the day of emergence and continued for 18–23 days, in the case of one female for more than 116 days. Host eggs in almost any stage of development were attacked, and 1–3 eggs, generally 2, deposited in each. The significance of the different operations involved in oviposition, which occupied at least 47 minutes, is discussed. The female invariably feeds on material pumped from the egg during the process, but this food is not necessary for the maturation of its eggs. Descriptions are given of the egg, larval, prepupal and pupal stages, which are all passed in the host egg and lasted about 2–3, 4, 1½, and 7 days, respectively. The larva passes through four instars, in the first three of which it possesses a metapneustic tracheal system and remains attached to the persistent egg-shell. In the fourth instar it is peripneustic; it is at first attached to the egg-shell and has 8 pairs of spiracles covered by a membrane (apparently the third larval skin), but later detaches itself from both and moves freely in the host egg. As many as 5 larvae may develop in one host egg, but in all cases the contents of the egg are completely absorbed. Unmated females of *O. johnsoni* produce only male progeny, but were as prolific as mated ones. In the field, the females outnumbered the males by about 4 to 1. The life-cycle was completed in 16–17 days, and there are probably 2 generations of the parasite to 1 of the host.

A discussion is appended on the rôle of the egg-shell in the respiration of certain Encyrtid larvae. It is suggested that young larvae of *O. johnsoni*, and probably of other species of Encyrtids with stalked eggs and metapneustic larvae, may obtain atmospheric air by means of a peculiar structure of the egg-shell, which is described, and not through the hollow stalk of the eggs as has previously been supposed.

CARTER (W.). **Aphis Transmittal of** *Commelina nudiflora* **Linnaeus Mosaic to Pineapple.**—*Ann. ent. Soc. Amer.* **30** no. 1 pp. 155–158, 2 pls., 6 refs. Columbus, Ohio, March 1937.

Experiments in Hawaii [*cf. R.A.E.*, A **24** 504] showed that the mosaic disease of *Commelina nudiflora* could be transmitted to pineapple by *Aphis gossypii*, Glov., *Myzus persicae*, Sulz., and *Macrosiphum solanifolii*, Ashm., which developed and reproduced freely on seedling pineapple plants. The production of winged forms on *C. nudiflora* was rare. The symptoms of the virus in pineapple are so similar to those of pineapple yellow spot, particularly in the later stages, that they may easily be confused, but until the virus can be recovered from diseased pineapple plants in the field, it must be assumed not to occur there. In the field, the Aphids are probably unable to penetrate the harder tissues of the pineapple plants; it thus appears that a plant may be highly susceptible to a virus but so unfavourable for a specific vector that infection is rare.

FERRIS (G. F.). **Contributions to the Knowledge of the Coccoidea (Homoptera). IV.**—*Microentomology* **2** pp. 1–45, 36 figs. Stanford Univ., Calif., March 1937.

In this contribution, which is supplementary to an earlier one [*R.A.E.*, A **24** 565], 36 genotypes of Diaspine Coccids are listed and figured, and notes are given on the morphology of the groups dealt with and the status of the genera.

Service and Regulatory Announcements October–December 1936.—*S.R.A., B.E.P.Q.* no. 129 pp. 151–207. Washington, D.C., U.S. Dep. Agric., March 1937.

A revision (effective 14th October 1936) of Quarantine no. 52 against *Platyedra (Pectinophora) gossypiella*, Saund., releases from restriction all parts of the State of Florida formerly included in the regulated area, as no infestation of cotton occurred there in 1935 or 1936 [*cf. R.A.E.*, **24** 803]. In an announcement (B.E.P.Q. 417) relating to the Fruit and Vegetable Quarantine, no. 56, a revision [*cf.* **23** 236] of the conditions of entry into the United States of grapes, directed against the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.], provides that they shall be packed in tight barrels, kegs or other approved containers, and that they shall be delivered within 24 hours of unlading to an approved sterilisation plant, where, under official supervision, they will be cooled until the approximate centre of the fruit in the package reaches a temperature of 34°F., at or below which the fruit will be held for 12 days. Recent work has proved that all stages of the fly in fruit are destroyed by this treatment. Grapes may still only be imported between 1st October and 15th April [*cf. loc. cit.*]. Plant quarantine restrictions issued by the United Kingdom (including the Channel Islands), Trinidad and Tobago, the British Virgin Islands, Finland and Bulgaria are summarised, and amendments to German restrictions subsequent to the last summary [*cf.* **24** 803] are noted.

Smith (L. M.). **Growth, Reproduction, Feeding, and Wing Development of the Mealy Plum Aphid in Relation to climatic Factors.**—*J. agric. Res.* **54** no. 5 pp. 345–364, 9 figs., 23 refs. Washington, D.C., 1937.

An account is given of experiments on *Hyalopterus arundinis*, F. (*pruni*, F.) on plum in California [*cf. R.A.E.*, A **25** 316] to determine the influence of climatic factors on growth, reproduction and feeding of the fundatrices and fundatrigeniae and on the production of winged forms by the latter. The literature on wing determination in Aphids is discussed at some length. The following is substantially the author's summary : A high correlation existed between rate of development of the Aphids and daily mean temperature. Formulae for the determination of the rate of development per day at any mean temperature are presented. The four instars were of approximately equal duration at any given mean temperature. The correlation between number of young born and daily mean temperature ranged from 0·54 to 0·75 under varying conditions. Rate of reproduction was shown to be related to age of females, which in turn was influenced by temperature. The rate of feeding was related to temperature, but did not increase as rapidly as the rate of reproduction, for a given increase in temperature. This results in the relative starvation of young born at higher temperatures and is offered as an explanation of wing determination.

Dawsey (L. H.), Cressman (A. W.) & Hiley (J.). **The relative Quantities of Oil deposited upon Paraffin-coated Plates and upon Plant Foliage by Oil Sprays.**—*J. agric. Res.* **54** no. 5 pp. 387–398, 3 figs., 13 refs. Washington, D. C., 1937.

The following is the authors' summary : A method is described for spraying paraffin-coated mica plates with oil emulsions and determining the quantities of oil deposited by difference in weight. Comparison between the quantities of oil deposited on the paraffin surfaces of the plates and those deposited on chrysanthemum foliage, as determined by chemical analysis, showed that various emulsions give different ratios of plant deposit to plate deposit. It is therefore not practical to attempt to standardize the sprays intended for the plant surface against the plate surface. Within certain limits of error, emulsions containing glue, ammonium caseinate, or bentonite gave characteristic ratios of plant deposit to plate deposit, which were independent of the oil concentration or the emulsifier concentration in the dilute sprays, but with soap emulsions these ratios varied with the concentration of oil and emulsifier.

McMunn (R. L.). **Tables for rapid Calculations of Spray and Dust Requirements.**—*Illinois Hort.* **26** no. 2 pp. [4]–[7]. Salem, Ill., April 1937.

Tables are given for the rapid calculation of the quantities of sprays and toxic ingredients for them required to treat fruit trees of different ages with different rates of application per year of tree age, and the amounts of ingredients required in dusts for given rates of application of the mixed dust per tree. These figures serve as a basis for determining the amounts required for different numbers of trees.

Walkden (H. H.). **Notes on the Life History of the Bronzed Cutworm in Kansas.**—*J. Kans. ent. Soc.* **10** no. 2 pp. 52–59, 1 fig., 8 refs. McPherson, Kans., April 1937.

Nephelodes emmedonia, Cram. (bronzed cutworm) has long been considered a minor pest of cereals and forage grasses, particularly bluegrass (*Poa*) in eastern Canada and the northern part of the United States east of the Rocky Mountains [*cf. R.A.E.*, A **15** 185 ; **25** 369], but is only occasionally abundant enough to cause even moderate damage. An account is given of observations on its life-cycle and seasonal history carried out for several years in Kansas. This State is towards the southern limit of its range, and the larval diapause is consequently somewhat prolonged [*cf.* **15** 185] ; most of the mature larvae that cease feeding and make their earthen pupal cells at the beginning of May do not pupate until the middle of August. The average duration of the egg, larval and pupal stages in an outdoor insectary were 127, 231 and 28 days, respectively, and the adults lived for 3–16 days. The average number of eggs dissected from newly emerged females was 1,071. Males were slightly more numerous than females among reared moths and very much more numerous in light traps or bait traps, in which hardly any females were taken.

Measurements of the head capsule in all but the last of the larval instars are tabulated, and the rearing technique is briefly described. Of 169 larvae collected in the field, 1 per cent. were parasitised by unidentified Hymenoptera, and of the larvae under observation, 32 per cent. were killed by a wilt disease and 1 per cent. by a fungus.

Fracker (S. B.). **Technique of Large-scale Operations in Pest Control.**—*Proc. ent. Soc. Wash.* **39** no. 3 pp. 41–58, 19 refs. Washington, D.C., April 1937.

The methods and organisation used in the United States in large scale operations for the control of insect pests and plant diseases, as distinct from the voluntary control measures applied by private growers, are reviewed, and it is pointed out that any scheme for the control or eradication of a pest in a large area, or the prevention of its spread from such an area, must be based on three factors.

Firstly, the exact distribution of the pest must be determined. The methods of making distribution surveys are discussed, with special reference to the more modern ones, such as the use of traps, the search for pests on alternative food-plants, etc. Secondly, the administrative organisation must be agreeable to property owners and all those deriving no direct benefit from the control measures, and at the same time command powers of access, inspection, treatment, destruction and quarantine. All these should be specifically authorised in the pest-control statutes, both Federal and State. Thirdly, large-scale operations should not only protect a given area from loss, but should either exterminate or materially reduce the population of the pest. The basic principle involved in eradication is that more stringent action must be taken than can be shown at the moment to be necessary. Illustrations of this point are given from campaigns in the United States against the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.], which has apparently been completely eradicated, the pink bollworm [*Platyedra gossypiella*, Saund.], which has been eradicated in certain areas, and the gipsy moth [*Lymantria dispar*, L.]. Measures for the eradication of the last-named in Massachusetts were stopped in 1900, when they no longer appeared absolutely necessary ; four years later it was again extremely injurious. Measures employed in eradication and control projects are reviewed, including particular mechanical and chemical methods of destruction of the insects, of alternative food-plants, and of economic food-plants in certain zones, as well as devices for treatment of products moving between infested and uninfested areas.

BURDICK (H. C.). **The Effects of Exposure to low Temperature on the developmental Time of Embryos of the Grasshopper** *Melanoplus differentialis* (**Orthoptera**).—*Physiol. Zool.* **10** no. 2 pp. 156–170, 6 graphs, 23 refs. Chicago, Ill., April 1937.

An account is given of an extensive series of experiments carried out in Iowa to study the effect of exposure to low temperature on the embryonal diapause in *Melanoplus differentialis*, Thomas [*cf. R.A.E.*, A **18** 623 ; **21** 19]. Eggs kept at 28°C. [82·4°F.] showed marked variations in the duration of the diapause, the minimum incubation periods of eggs from different pods ranging from 32 days, required for development without a diapause, to 107 days. The nature of the variations suggests that they are not random, but are determined by some environmental or physiological factors acting before the eggs are laid. Eggs kept at a constant temperature of 15°C. [59°F.] did not complete their development.

In eggs exposed for varying lengths of time to low temperatures ranging from 0 to 15°C. [32–59°F.], either immediately after hatching or after they had undergone development at 28°C. for periods of 7, 14 and 21 days, the exposure usually accelerated development, as compared with controls kept all the time at 28°C. An analysis of results showed that the responses of the eggs depend on their potentialities in respect to the length of the diapause, on the embryonal stage reached before the exposure, on the degree of low temperature, and on the duration of the exposure to it.

LUDWIG (D.) & LANDSMAN (H. M.). **The Effect of different relative Humidities on Survival and Metamorphosis of the Japanese Beetle** (*Popillia japonica* **Newman**).—*Physiol. Zool.* **10** no. 2 pp. 171–179, 4 figs., 15 refs. Chicago, Ill., April 1937.

An account is given of experiments to test the effects of different relative humidities on weight loss, survival and metamorphosis of third-instar larvae, prepupae and pupae of *Popillia japonica*, Newm. [*cf. R.A.E.*, A **23** 59]. During the experiments each individual was kept in an unstoppered vial at the required humidity and at a temperature of about 25°C. [77°F.]; the larvae were given no food. Daily weight readings were made until death or metamorphosis occurred, when the residual water content was determined. Faecal matter and exuviae were included in all weight readings. The following is the authors' summary: The loss in weight and water of third instar larvae, prepupae and pupae of the Japanese beetle are inversely proportional to the relative humidity of the environment. The time of survival of third instar larvae is greater at higher humidities. In the case of prepupae and pupae, many individuals metamorphosed at the higher humidities, and therefore the time of survival (which includes the duration of the prepupal or pupal stages in the metamorphosing individuals) is reduced. Loss in weight is due to water loss; hence, there is no conservation of metabolic water in the three stages studied. Death occurred at approximately the same water content regardless of the rate of desiccation. An almost saturated medium is necessary for the metamorphosis of prepupae and pupae, whereas third instar larvae are unable to metamorphose at any humidity when starved.

PECHUMAN (L. L.). **An annotated List of Insects found in the Bark and Wood of** *Ulmus americana* **L. in New York State.**—*Bull. Brooklyn ent. Soc.* **32** no. 1 pp. 8–21. Brooklyn, N.Y., 1937.

This annotated list of insects taken on trees or logs of *Ulmus americana* in New York in the course of work on Dutch Elm Disease [caused by *Ceratostomella ulmi*] comprises 55 Coleoptera, 45 Hymenoptera, 15 Diptera in addition to undetermined Cecidomyiids and Anthomyiids, 4 Lepidoptera, 2 Heteroptera, 4 Psocoptera, the termite, *Reticulitermes flavipes*, Kollar, and unidentified Thysanoptera.

STRUBLE (G. R.). **The Fir Engraver Beetle, a serious Enemy of White Fir and Red Fir.**—*Circ. U.S. Dep. Agric.* no. 419, 15 pp., 4 pls., 3 figs., 4 refs. Washington, D.C., January 1937.

An account is given of the distribution, bionomics and control of *Scolytus ventralis*, Lec., on firs in the United States. The losses are heaviest in Oregon and California; in the latter State it is estimated that 15 per cent. of the stand is destroyed and a further 25 per cent. injured by this Scolytid. It has been found throughout the west of the United States and in western Canada. It is particularly destructive to white fir (*Abies concolor*), lowland white fir (*A. grandis*) and California red fir (*A. magnifica*), although it has also been taken from Alpine fir (*A. lasiocarpa*), Douglas fir (*Pseudotsuga taxifolia*), Engelmann spruce (*Picea engelmanni*) and mountain hemlock (*Tsuga mertensiana*).

The adult beetles are found commonly in fir timber in July and August and less frequently in June and September. Attacks are made along the main trunk, usually in the roughened bark surrounding the bases of the branches. In 36–48 hours a hole is formed that slants upwards into the cambium layer, and the nuptial chamber is then made by grooving the surfaces of the sapwood and the inner bark. As soon as it is completed, the female starts to excavate 2 egg-galleries, which extend horizontally for 2–6 inches in opposite directions. Their construction continues during the entire oviposition period of 5–7 weeks. From 100 to 300 eggs are deposited in niches 1–1·5 mm. apart along the cambium layer on each side of the galleries, and the female then backs into the entrance hole and dies. The male abandons the female 2–3 weeks before the end of the oviposition. About 4–6 days after an egg-gallery is begun, a yellowish-brown discoloration of the cambium caused by a fungus (*Trichosporium symbioticum*) appears on each side of the gallery and spreads upwards and downwards. This apparently assists in overcoming the resistance of the tree by drying the cambium layer. The larvae hatch in 9–14 days, feed separately in individual mines extending at right angles to the egg-gallery, and pupate at the end of them. The length of the larval stage depends on the prevailing temperatures of the bark and varies from 41 days at an elevation of 3,500 ft. to 380 days at 7,500 ft. The larvae hibernate during the winter months. Pupae are most common in the inner bark and are found from mid-May in some areas, but not until July in others; they are rarely taken after mid-September. The pupal stage lasts 10–14 days, and adults remain inactive for 7–14 days before emerging from the tree. During flight, some feeding is done on the thin bark of the trunk and large branches of fir trees. Suitable host trees appear to be found by chance selection, and green logs or trees lying on the ground in sheltered places are readily attacked. In the central Sierra Nevada, one generation occurs yearly at elevations between 4,500 and 6,000 ft., one generation every two years at elevations above 8,000 ft., or above 6,000 ft. on north exposures, and one generation and part of a second in one year at 3,500–4,000 ft. on south exposures and with a long warm summer. The broods overlap considerably owing to the length of the periods of attack and oviposition.

Infestation causes the foliage of the branches adjoining the main bole near the point of attack to fade. The types of damage caused to the trees are described. Top-killing often continues on the same trees for several years, resulting in additional injury of the crown until the tree is weakened beyond recovery. In vigorous trees, injured areas of cambium generally heal over. Some trees are killed by successive attacks of *S. ventralis* and others by secondary insects. During sporadic outbreaks, entire trees and groups of trees are killed in a single season. The relation of climate to infestation is obscure, and no correlation was evident between intensity of infestation and site or growth rate. Experiments in which beetles were caged on the trees resulted in the failure of the attacks under all conditions tried. It is possible that conditions favourable to attack may be produced in the tree by physiological changes interfering with the production and distribution of balsam, which is very toxic to the beetles and acts as a repellent.

The most important of the insects that infest firs either after, or in some cases before, *S. ventralis* is the Cerambycid, *Tetropium abietis*, Fall, which attacks the lower bole of infested trees, hastening their death, and is also able to kill weakened ones without the assistance of *S. ventralis*. The other secondary pests on which notes are given are: the Scolytids, *S. praeceps*, Lec., *S. subscaber*, Lec., *Pseudohylesinus grandis*, Sw., *Gnathotricus sulcatus*, Lec., and *Pityophthorus pseudotsugae*, Sw.; the Platypid, *Platypus wilsoni*, Sw.; the Lamiids, *Monochamus oregonensis*, Lec., and *Leptostylus nebulosus*, Horn; and the Buprestid, *Melanophila drummondi*, Kby.

Natural enemies of *S. ventralis* may destroy up to 84 per cent. of the brood. Predators include the Trogositid, *Temnochila virescens*, F., var. *chlorodia*, Mann., the Clerids, *Thanasimus nigriventris*, Lec. (*lecontei*, Wolc.), *T. undatulus*, Say, and *Enoclerus sphegeus*, F., and a Dolichopodid of the genus *Medeterus*. The larvae are parasitised by *Coeloides scolyti*, Cush., *C. brunneri*, Vier. and *Cecidostiba thomsoni*, Cwfd., and all stages by the mite, *Pediculoides ventricosus*, Newp.

From experimental treatments on broods in dead trees that had been felled, it was concluded that the application of dusts and oils was ineffective. Peeling the infested bark off the top half of the log and scorching the rest gave 100 per cent. mortality. Sun-curing was successful in bark up to 20 mm. thick when air temperatures were 80°F. or above; logs should be exposed to the sunlight for at least 6 hours daily while lying in a north and south direction, and turned one-third over every 5 days until all the surface has been exposed. Submergence of logs in water for 6 weeks resulted in 99 per cent. mortality. Unless the broods in top-killed trees or in partly injured boles can also be destroyed, the benefit from destroying broods in killed trees is largely nullified. The most practical means of control is by felling, peeling the bark and burning.

ARROW (G. J.). **A Beetle in a Bedstead.**—*Ent. mon. Mag.* **72** no. 869 p. 229. London, October 1936.

CANN (F. R.). **Further Records of** *Eburia quadrigeminata* **Say.**—*Op. cit.* **73** no. 874 pp. 55–56, 1 pl. March 1937.

In the first paper is recorded the occurrence in London of an adult of the North American Cerambycid, *Eburia quadrigeminata*, Say, in a bedstead in which the larva had remained for more than 5 years. The second contains records of the occurrence, in oak wood imported from America, of an adult in 1930, and of living larvae in 1934 and 1936. The larvae were found in parts of bedsteads manufactured at least 8–10 years previously. In America, the larva is known to be a heartwood borer of oak and other trees, preferring dry, solid wood.

CARLETON (M.). **A new Ichneumonid** (*Scopimenus pygobarbus*) **parasitic on** *Nematus proximus* **Lep. (Hym., Tenthredinidae) in Britain.**—*Ent. mon. Mag.* **73** no. 874 pp. 61–63, 1 fig. London, March 1937.

ROMAN (A.). **Description of a new Genus and Species of Ichneumonidae.**—*T.c.* pp. 63–65.

In the second paper, a Tryphonine Ichneumonid, *Scopimenus pygobarbus*, gen. et sp. n., is described in Latin from 2 females which, with 3 other females and 2 individuals that were not examined, emerged, as is recorded in the first paper, in August 1934 and 1935 from summer cocoons of *Nematus proximus*, Lep. (bean-gall sawfly of willows) and in June and early July 1935 from winter cocoons of the same species, several thousands of which were being reared in Britain. A brief account is given in the first paper of the method of rearing the sawfly larvae from galled leaves of *Salix triandra*. In all cases, the emergence of the Ichneumonid coincided with that of the sawflies from unparasitised cocoons. As *Angitia vestigialis*, Ratz., was emerging in large numbers at the same time, it was impossible to trace the cocoons from which *S. pygobarbus* had emerged. During the dissection of 1,950 cocoons of *N. proximus* in the winter of 1934–35, 11 ectoparasitic larvae were found feeding on the prepupae of the sawfly, but none was reared to maturity, as they seemed unable to survive the opening of the host cocoon, which generally consisted only in the cutting of a small window in the side. These may have been larvae of *S. pygobarbus*, as the only other parasite emerging from the cocoons was *A. vestigialis*, which is an endoparasite. They were always firmly attached to the skin of the prepupa by the shrivelled remains of the cast skins, and it was almost impossible to detach them without injury to the hooked caudal appendage. This unidentified larva is described.

WALTON (C. L.). **The economic Status of** *Elachiptera cornuta* **Fall.**—*Ent. mon. Mag.* **73** no. 874 pp. 65–66. London, March 1937.

A sample of oats from Gloucestershire examined in June 1936 was found to consist partly of plants stunted through attack by *Oscinella* (*Oscinis*) *frit*, L., and partly of strongly grown and apparently healthy plants. In the tissues of the latter were discovered a number of larvae from which adults, subsequently identified as *Elachiptera cornuta*, Fall., were reared. C. T. Gimingham stated that to his knowledge this fly has not been recorded as a pest in England, but has occasionally been mentioned as damaging oats in various countries on the Continent [*cf. R.A.E.*, A **20** 238]. In a work already noticed [**24** 106], it is stated that the larvae of *E. cornuta* occur near *O. frit*, that adults can be reared in considerable numbers from crops attacked by the latter, and that it is not considered necessary to devise a method of controlling *E. cornuta*, as it attacks only crops that are already spoiled. In view of this, attention is drawn to the fact that the larvae found in England were in plants that did not contain *O. frit* or show any of the symptoms characteristic of infestation by it.

AUSTIN (M. D.). **The Insect and allied Fauna of cultivated Mushrooms. III.**—*Ent. mon. Mag.* **73** no. 874 pp. 66–67. London, March 1937.

Since the publication of the two previous lists of insects and allied fauna of cultivated mushrooms in Britain [*R.A.E.*, A **21** 110, 397], several additional species have been observed and the records of them are here collated. Those not already noticed [**23** 185 ; **24** 682 ; **25** 338, 339] include *Sira buski*, Lubb., two individuals of which were found in a mushroom bed in southern England, and *Tyroglyphus farinae*, DeG., which was found associated with compost, but not with the growing crop.

STANILAND (L. N.) & BEAUMONT (A.). **Thirteenth Annual Report of the Department of Plant Pathology for the Year ending September 30th, 1936.**—*Pamphl. Seale-Hayne agric. Coll.* no. 47 35 pp. Newton Abbot, Devon, 1937.

Pests that caused damage in Devon and Cornwall during the year ending 30th September 1936, in addition to some of those noticed from the two previous reports [*R.A.E.*, A **23** 621 ; **24** 457], included : the frit fly [*Oscinella frit*, L.] on oats ; *Atomaria linearis*, Steph., on mangels ; *Phyllotreta* spp., on crucifers ; *Anthonomus pomorum*, L., on apple ; and *Caliroa* (*Eriocampa*) *limacina*, Retz., and *Eriophyes pyri*, Pgst., on pear. *Hoplocampa testudinea*, Klug, is slowly increasing on apples and new centres of infestation have appeared during the year. In trials by growers, a dust of lime with crude creosote gave some protection against narcissus bulb flies (*Merodon* and *Eumerus*). Cutworms caused severe damage to anemones, which in some cases were killed before the shoots appeared above the ground. Wireworms (*Agriotes* spp.) also occasioned some losses, particularly when the anemones had been grown on ley ground or where grass and weeds had become established on old narcissus-beds. Clean cultivation is essential where narcissus is combined with a rotation of anemones.

In tests on apple trees of 5 different types of shelter-bands, some hundred feet of each band were applied at each of three localities in June, and examined in December. *Anthonomus pomorum* was not caught in sufficient numbers to determine the relative efficiency of various bands. An average of over 20 larvae of *Cydia pomonella*, L., per band was caught in bands of Hessian sacking impregnated with proprietary waxes of two types. A double thickness of sacking tended to make these bands less effective. Corrugated paper bands impregnated with wax or beta-naphthol caught less than half this number and not noticeably more than untreated corrugated bands, but almost all the larvae caught in the beta-naphthol bands were dead. Bands of untreated sacking gave poor results.

Pests that have not been reported for 12 years, or that were taken on food-plants not previously recorded, included : *Prionus coriarius*, L., *Chrysoclista* (*Blastodacna*) *atra*, Haw., and *Ametastegia glabrata*, Fall., on apple ; *Monophadnus geniculatus*, Htg., on strawberry ; *Eriophyes similis*, Nal., on plum ; *Myzus persicae*, Sulz., on *Pittosporum* ; *Aphis rumicis*, L., on climbing *Polygonum* ; *Rhopalosiphum* (*Neomyzaphis*) *abietinum*, Wlk., on *Picea pungens* var. *kosteriana* (*Abies kosteri*) ; and *Pulvinaria floccifera*, Westw., on *Camellia*.

STEINER (P.). **Beiträge zur Kenntnis der Schädlingsfauna Kleinasiens V. Ueber einige wenig bekannte Kleinschädlinge der Zuckerrübe in der Türkei.** [Contributions to the Knowledge of the Pests in Asia Minor V. On some little known minor Pests of Sugar-beet in Turkey.]—*Z. angew. Ent.* **24** no. 1 pp. 1–24, 19 figs., 15 refs. Berlin, April 1937.

To supplement previous papers [*R.A.E.*, A **24** 738 ; **25** 52], notes, partly from the literature, are given on a number of minor pests observed on sugar-beet in Anatolia in 1933–35. Adults of the weevil, *Cleonus* (*Chromoderus*) *fasciatus*, Müll., appear about April in the beet fields and are still to be seen in July. The larvae formed earthen cells on the roots, killing the plants if the roots were thin and weak, and boring into them if they were well developed. Pupation occurred in July, the young adults appearing early in August. These adults can be destroyed by early harvesting and the manufacturing processes. *C. fasciatus* had a marked preference for light, sandy soil. In 1935 *Cleonus* (*Temnorhinus*) *kirghisicus*, Chevr., defoliated about 450 acres, appearing in numbers in April. The adults apparently fed on leaves on which they had laid eggs. Towards the end of April they also oviposited on *Chenopodium* in the beet-fields. The larvae fed on the roots of the beet and pupated in May. The new adults began to emerge from the ground in June, and a 5 per cent. spray of barium chloride proved effective against them. *Tanymecus dilaticollis*, Gyll., and, in smaller numbers, *T. palliatus*, F., were harmful as adults, but damage by the larvae was not observed. *Psalidium maxillosum*, F., was only an occasional pest, and some other weevils recorded caused no apparent injury.

The hot, dry steppes of some parts of Anatolia provide conditions favourable to Tenebrionids, of which *Pedinus strabonis*, Seidl., was the most harmful, though *Dasus* (*Gonocephalum*) *pusillus*, F., was almost as abundant. The larvae attack the plants underground and the adults above ground. In the laboratory, good results were obtained against adults of *Pedinus* with a bait containing 200 parts (by weight) wheat bran, 5 parts Urania green and 10 parts molasses, with the addition of a little water. The bait was ineffective when 2 parts sodium fluoride was substituted for the Urania green, and neither mixture was effective against Tenebrionid larvae. *Subcoccinella vigintiquatuorpunctata*, L., occasionally attacks beet and kills young plants backward in growth owing to dry weather. Larvae and adults of *Cassida seraphina*, Ménétr., and *C. vittata*, Vill., were found together on the plants, but caused no appreciable injury.

Of other pests, *Phthorimaea ocellatella*, Boyd, is apparently of little importance. Some infestations of the leaves by *Coreus disciger*, Kol., and of the roots by *Pseudococcus* sp. were observed.

MARCUS (B. A.). **"Detal"-Bestäubung gegen den Kiefernspanner** (*Bupalus piniarius* **L.**). [Dusting with "Detal" against the Pine Geometrid.]—*Z. angew. Ent.* **24** no. 1 pp. 71–86, 16 refs. Berlin, April 1937.

A detailed account is given of dusting from an aeroplane with "Detal" [*cf. R.A.E.*, A **24** 517] against *Bupalus piniarius*, L., infesting pine forests in the Palatinate in 1936. "Detal" contains a dinitro compound and is a yellow, almost odourless powder. As it causes injury to mucous membrane and to skin lesions, the operators wore goggles and respirators. The dust, applied at the rate of 37 lb. per acre, acted more quickly than any previously available and gave an average mortality of 99·8 per cent. Two or three days after dusting, the pines showed slight scorching, but soon recovered fully. The needles of spruce and larch and the leaves of beech and birch showed distinct scorching, but the buds were unharmed, so that the injury was only temporary. Silver firs [*Abies*] were quite unaffected, owing to the wax coating of the needles, and meadows showed no signs of injury. The active constituent is rapidly decomposed by atmospheric humidity, usually in one day, or, with a thick layer of the dust, in three days at most, so that dusted berries may be safely eaten after the third day, but a 10-day ban was imposed and is advocated.

Brandt (H.). **Untersuchungen über die Aenderung des Geschlechtsverhältnisses bei der Nonne** (*Lymantria monacha* **L.**) **und ihre Ursachen.** [Investigations on the Change in the Sex Ratio in the Nun Moth and its Causes.]—*Z. angew. Ent.* **24** no. 1 pp. 87–94, 2 figs., 10 refs. Berlin, April 1937.

Investigations on the sex ratio in *Lymantria monacha*, L., showed that the sexes are present in about equal numbers at the beginning of larval life. A displacement then occurs, however, owing to the higher mortality of female first-instar larvae, if food is scarce, atmospheric humidity low or temperature high.

Komárek (J.). **Kritisches Wort über die Bedeutung der Insektenparasiten der Nonne.** [A critical Note on the Importance of the Insect Parasites of the Nun Moth.]—*Z. angew. Ent.* **24** no. 1 pp. 95–117, 42 figs. Berlin, April 1937.

Part of this paper is by S. Kolubajiv and consists of a list of central European parasites of the nun moth, *Lymantria monacha*, L. (with 2 Swedish and 1 Russian species) and a key to the families, subfamilies, genera and some of the species.

The senior author points out that, in view of the large number of parasites of *L. monacha*, outbreaks should be rare, whereas they are, in fact, of frequent occurrence, especially in unmixed stands of spruce, which are common in Bohemia. He shows in a discussion that the value of Tachinids is reduced by the fact that, in all stages, they are more susceptible to adverse factors, including weather, natural enemies, etc., than is *L. monacha* and usually increase less rapidly. Ichneumonids are less important than Tachinids, even *Ichneumon disparis*, Poda, the chief Hymenopterous parasite, being rare by comparison, and *L. monacha* seems to be merely an occasional host for them.

The author considers that biological control of an imported forest pest can only succeed if the pest was controlled by parasites in its country of origin. In laboratory breeding of such parasites as the most important nun moth Tachinid, *Phorocera* (*Parasetigena*) *silvestris*, R.-D., considerable difficulty occurs owing to the sensitivity of the puparia and adults to external conditions, so that the practical use of this fly is scarcely possible. Ichneumonids are more easily bred, but have little effect on the moth when liberated, as they are polyphagous. Further study of the biology of predators is required to ascertain whether control of the nun moth by them is possible.

Hundertmark (A.). **Verbreitungsmöglichkeiten der Nonne** *Lymantria monacha* **L. durch die Eiraupen.** [The Possibilities of Spread of the Nun Moth by Means of the First-Instar Larvae.]—*Z. angew. Ent.* **24** no. 1 pp. 118–128, 6 figs., 3 refs. Berlin, April 1937.

First-instar larvae of *Lymantria monacha*, L., placed on a white surface in the centre of a circle of blocks, ranging in colour from white to black and all 12 in. from the centre, moved in almost a straight line to such blocks as contrasted with the background. Normally they climbed only such blocks as were darker than the background. In other experiments, they moved to the nearest block among blocks of the same colour, and were strongly positively phototactic and negatively geotactic. Their tendency to climb to the summit of spruce trees and disregard lateral branches was confirmed, and it is suggested that they do this not merely in search of food but also to allow themselves to be blown away by wind. Experiments on rate of fall showed that even light winds blowing upwards would be able to carry the larvae for several miles. The slow rate of fall of this instar (about 26 ins. per second) is due to hairs, the distribution of which is described. In all these experiments, the larvae allowed themselves to fall only if the wind speed was 1¼–2½ metres per second [2·8–5·6 m.p.h.] or less. In nature, stronger winds usually occur in stormy, wet weather and the larvae would be quickly borne to the ground by the rain.

KÜTHE (K.). **Zur Biologie und Bekämpfung des Apfelwicklers** (*Carpocapsa pomonella* **L.**). [The Biology and Control of *Cydia pomonella*.]—*Z. angew. Ent.* **24** no. 1 pp. 129–144, 6 figs., 11 refs. Berlin, April 1937.

Notes are given on the occurrence in 1935 of *Cydia* (*Carpocapsa*) *pomonella*, L., on apple in Germany, and particularly in the district of Landsberg a. Warthe, Prussia, together with an account of experiments in this district. The following is largely based on the author's summary: In 1935 there were two generations in many parts of Germany, including Landsberg, where two had also occurred in 1934. A second generation is probable in localities with an average temperature for June–July of over 18°C. [64·4°F.] and an average maximum of over 23°C. [73·4°F.]. One generation is probable where the corresponding temperatures are under 17°C. [62·6°F.] and 22°C. [71·6°F.]. A flight period of two months (June–July) for one generation and of three (June–August) for two generations may be expected, its commencement depending on air-temperature. In Landsberg, it began on 12th May in 1934 and 2nd June in 1935, in both cases a fortnight after blossoming. Adult emergence of the overwintered generation ended early in July, and of the summer one at the end of August. In heavily infested districts, bait-traps hung in the trees may be used as indicators of the flight, and in only slightly infested districts, the emergence of moths from at least 100 cocoons that have hibernated in the open. The percentage of larvae that pupate in summer decreases progressively from 1st July to 1st August; no larvae that became full-grown after 1st August pupated before the winter.

Experiments in spraying gave poor control, but orchard sanitation, scraping the trees and the application of shelter bands were found to be useful measures. The bands, which are strongly recommended, should be applied at the end of June, and if a second generation occurs, they must be removed at the end of July and replaced.

PAPERS NOTICED BY TITLE ONLY.

GETZENDANER (C. W.). **The Introduction and Propagation of** *Digonichaeta* [*Bigonicheta*] *setipennis*, **Fall., a Parasite of the European Earwig** [*Forficula auricularia*, L., in Washington].—*Proc. ent. Soc. B.C.* no. 33 pp. 8–12. Victoria, B.C., January 1937. [*Cf. R.A.E.*, A **25** 240.]

HERIOT (A. D.). **The Crumena of the Coccidae and the** *Adelges* [*Chermes*].—*Proc. ent. Soc. B.C.* no. 33 pp. 22–24. Victoria, B.C., January 1937.

James (H. C.). **On the Pre-adult Instars of** *Pseudococcus longispinus* **Targ.** [*adonidum*, **L.**] **with special Reference to Characters of possible generic Significance (Hem.).**—*Trans. R. ent. Soc. Lond.* **86** pt. 5 pp. 73–84, 6 figs., 10 refs. London, April 1937.

Takahashi (R.). **A new Genus and Species of Aphididae** [*Trichaitophorus aceris* on *Acer rubescens*] **from Formosa (Homoptera).**—*Annot. zool. jap.* **16** no. 1 pp. 17–19, 1 fig. Tokyo, April 1937.

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